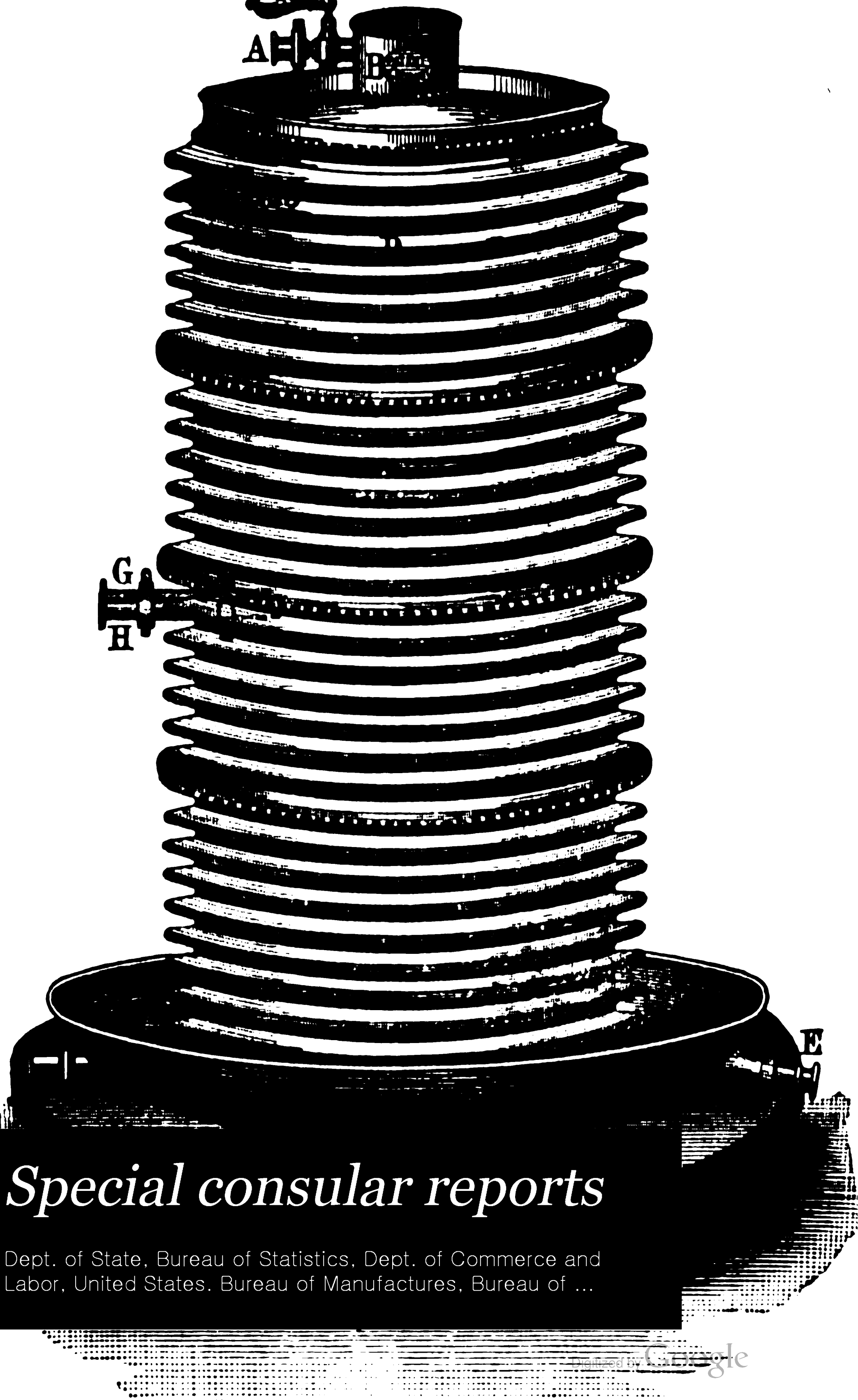

Special consular reports

Dept. of State, Bureau of Statistics, Dept. of Commerce and Labor, United States. Bureau of Manufactures, Bureau of ...

SPECIAL

CONSULAR REPORTS.

Volume II.

ARRANGEMENT.

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REFRIGERATORS AND FOOD PRESERVATION

IN

FOREIGN COUNTRIES.

REPORTS FROM THE CONSULS OF THE UNITED STATES, ON THE USE OF REFRIGERATORS AND NATURAL AND MANUFACTURED ICE, FOR THE PRESERVATION OF FOOD IN THEIR SEVERAL DISTRICTS, IN ANSWER TO A CIRCULAR FROM THE DEPARTMENT OF STATE.

ISSUED FROM THE BUREAU OF STATISTICS, DEPARTMENT OF STATE. ALL REQUESTS FOR THESE REPORTS SHOULD BE ADDRESSED TO THE SECRETARY OF STATE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1890.

REFRIGERATOR CIRCULAR.

DEPARTMENT OF STATE,
Washington, November 25, 1889.

To the CONSUL OF THE UNITED STATES
At ——— ———:

SIR: With a view to extending their trade to foreign markets, the manufacturers of refrigerators in the United States desire information in regard to the use of such articles in foreign countries, viz:

(1) Are refrigerators used in your consular district, and to what extent?

(2) Are there any peculiar features required in the construction of refrigerators for your district?

(3) Where are the refrigerators in use in your district manufactured?

(4) Sizes, formations, and prices of refrigerators in use in your district?

(5) How is ice secured in your district, and the price per 100 pounds thereof?

It is believed that many countries would adopt the American system of preserving foods and liquids, if made acquainted therewith; hence you are requested to investigate this phase of the subject as much as possible.

Where refrigerators are not in use you are requested to report upon the conditions which prevail relative to the preservation of foods and liquids, and whether the American refrigerators could not be so modified as to meet local requirements in your district.

Report, also, upon the best manner of introducing refrigerators into your district.

I am, sir, your obedient servant,

ALVEY A. ADEE,
Second Assistant Secretary.

CONTINENT OF AFRICA.

EGYPT.

REPORT BY VICE-CONSUL-GENERAL GRANT, OF CAIRO.

So-called refrigerators are in general use in the larger towns of Egypt, but are of an inferior quality, often being mere ice-boxes.

No peculiar features are required. Those in use are principally of local manufacture. They are very plain and simple, and could well be replaced by American articles, were it not for the great expense of transportation.

There are two types of refrigerators made here, one like a chest, being a simple ice-box lined with zinc, which sometimes has a zinc shelf over the ice and sometimes not. It generally contains a zinc compartment for the purpose of keeping cold water. The other has a door. Neither of them are made with double doors or linings filled with sawdust or other material, and there is therefore waste of the ice.

The prices of the two kinds mentioned vary, according to size, from 60 francs, or \$12, to 90 francs, or \$18, and perhaps 100 francs, or \$20.

In Egypt ice is manufactured, there being two manufactories in Cairo, one in Alexandria and one in Suez. There is said to be one also in Mansourah. At different times attempts have been made to import natural ice from America and from Sweden, but they failed on account of the lower price of manufactured ice. The ice manufactured in Cairo is frozen at 50° centigrade by means of compressed air, without the aid of acids or chemicals. It is sold at 40 cents for a block weighing 44 pounds, and at proportionate rates for the half block.

There being no plans or illustrations of American refrigerators at this office it would be difficult to investigate satisfactorily the question of their successful introduction into Egypt, but there appears to be nothing to hinder the ready sale of this article here except the price, which must necessarily be high on account of the great cost of transportation. Nevertheless the founding of an establishment in Egypt by some enterprising company, for the purpose of manufacturing refrigerators on the American principle, might be feasible, as labor is cheap here. But such a company would have to seek other markets for its products besides Egypt.

Water is generally kept cool in cheap, porous earthen jars or bottles, called "goulies," manufactured in Upper Egypt, the best of them com-

ing from Keneh. The coolness is produced by the transpiration of the water through the jar and by the consequent evaporation.

Milk is preserved by boiling; butter is kept in water.

Usually every house or apartment is provided with a small safe or cupboard, perforated with holes to allow of a current of air, attached to the window-sill of the kitchen or dining-room.

LOUIS B. GRANT,
Vice-Consul-General.

UNITED STATES CONSULATE-GENERAL,
Cairo, April 21, 1890.

MADEIRA.

REPORT BY CONSUL JONES, OF FUNCHAL.

During the winter season snow and hail fall on the mountains, and this is gathered and put into caves and brought down, as required, in the early morning.

It is very expensive—worth $1.50 for what a man can carry in a basket.

Mr. Reid, the proprietor of four hotels in this city, has requested Mr. Summers-Clerk, a celebrated architect of London, to look into an American refrigerator now in use in that city, and give his opinion on same.

I should like to have some illustrations showing the refrigerator, price-list, etc.

T. C. JONES,
Consul.

UNITED STATES CONSULATE,
Funchal, January 20, 1890.

MOROCCO.

REPORT BY VICE-CONSUL STALKER, OF TANGIER.

Refrigerators are used in this consular district to a very limited extent, and there are no peculiar features required in their construction.

These were manufactured in the United States.

Sizes, formations, and prices are unknown.

Ice is imported from Gibraltar, at about $5 per 100 pounds.

ROBERT STALKER,
Vice-Consul.

UNITED STATES CONSULATE,
Tangier, January 31, 1890.

REUNION.

REPORT BY COMMERCIAL AGENT RAYEUR.

Refrigerators are not in a great demand in our country, because the people are not very fond of ice.

In June and July we have ice and snow on the top of two of our mountains; but few people mind it; nevertheless, in one of our hotels ice is used to cool beverages in summer, but on so small a scale that refrigerators have no chance to be sold here.

EDOUARD RAYEUR,
Commercial Agent.

ST. DENIS (ISLAND OF REUNION),
January 22, 1890.

SENEGAL.

REPORT BY CONSUL STRICKLAND, OF GORÉE DAKAR.

Refrigerators are used to some extent in this consular district. No peculiar features are required in their construction.

There are no refrigerators that I am aware of in this consular district except American, and as yet not many of these.

Eddy's small box-shaped refrigerator for families, price $15, is the one now mostly depended on.

Ice, until lately, has been manufactured as wanted by steam machines, but early last summer the bark *Mejunticork* brought a shipment here from Boston, which was stored at Dakar in an ice-house of wood, constructed for the purpose, and retailed at about 4½ cents per pound. It did not, however, prove a paying speculation on account of the rapid melting of the ice after it was uncovered for sale, but this difficulty is now sought to be obviated by dividing the ice-house into compartments and uncovering one at a time.

A small shipment of ice was also imported last season at St. Louis from Portland, with similar results.

There will be some demand for small-sized refrigerators for families in the future, but parties are at hand to furnish them.

PETER STRICKLAND,
Consul.

UNITED STATES CONSULATE,
Gorée-Dakar, February 4, 1890.

ZANZIBAR.

REPORT BY CONSUL PRATT.

Refrigerators are used in this consular district to a very limited extent. There are no peculiar features required in their construction.

The refrigerators in use in this district are manufactured here. No uniformity in size is observed.

Ice is chemically manufactured at a price of $3 per 100 pounds.

By the foregoing it will be observed that there can be little demand for refrigerators in this district, the high price of the manufactured ice precluding the practicability of its use as a preservative. The small local demand for ice is solely for use in cooling beverages.

SETH A. PRATT,
Consul.

UNITED STATES CONSULATE,
Zanzibar, *February* 10, 1890.

SOUTH AFRICA.

REPORT BY CONSUL HOLLIS, OF CAPE TOWN.

Under the present condition of the ice market here but little can be said that would encourage the manufacturers of refrigerators to incur any expense in endeavoring to introduce their wares into this market.

The refrigerators used here are mostly of American manufacture and of the medium size.

The ice in use is the artificial or chemically made, and the quotation made me to-day for a daily supply of 10 pounds was 3 cents per pound.

I have no doubt that, given ice at a reasonable price, a much larger number of refrigerators would be imported; but with ice at the price named, and an almost total failure to meet the demand on the hottest days when most needed, it is not surprising to learn that the largest houses do not average more than four or five sales a year.

I have informed a New York manufacturer of ice-machines of the condition of the business of ice manufacture here, and think it probable that he will make an improvement in this line by entering this market with the most modern machine.

In this climate ice could be used with comfort all the year round and would be under more favorable conditions.

The condition of this trade, as briefly outlined above, is applicable to the whole country.

GEO. F. HOLLIS,
Consul.

UNITED STATES CONSULATE,
Cape Town, *February* 15, 1890.

CONTINENT OF AMERICA.

BRITISH NORTH AMERICA.

AMHERSTBURG.

REPORT BY CONSUL TURNER.

In answer to the interrogatories contained in Department circular under date of November 25, 1889, I have the honor to report: Refrigerators are used in this consular district by all who can afford to purchase them. There are no peculiar features required in the construction. The refrigerators in use in this district are principally of American manufacture. Sizes, formation, and prices are, 3 by 5, 4 by 6, and 5 by 7 feet; average in price from $15 to $40. Ice is secured from the Detroit River and Lake Erie; price from 15 to 20 cents per 100 pounds. It is believed that the people of this consular district would adopt the American system of preserving foods and liquids, if made acquainted with them, by establishing agencies for that purpose where refrigerators are not in use. The conditions which prevail relative to the preservation of foods and liquids, are ice-boxes. American refrigerators could be so modified as to meet local requirements.

JOSIAH TURNER,
Consul.

UNITED STATES CONSULATE,
Amherstburg, January 27, 1890.

BRITISH COLUMBIA.

REPORT BY VICE-CONSUL MARVIN, OF VICTORIA.

Refrigerators are used in this consular district to a limited extent.

There are no peculiar features required. Those in use in this district are manufactured at Montreal.

The sizes are 4 by 6 feet, and the prices from $10 to $50.

Ice is secured in ice-houses, and the price thereof is 2 cents per pound.

In this consular district the heat of summer is never extreme, and therefore the demand for refrigerators is small, and those that are in use in this district are chiefly of Canadian manufacture. It would be

useless to think of introducing refrigerators into this district, as the climate during the two or three hottest months of the year is never so intense as to require them, and the duty is too high to import them.

EDGAR MARVIN,
Vice-Consul.

UNITED STATES CONSULATE,
Victoria, December 30, 1889.

CHATHAM.

REPORT BY COMMERCIAL AGENT EDDY.

Refrigerators in use in this consular district are the same as used in Michigan. They are generally manufactured in this consular district, although some are imported from the United States.

Ice in this district is secured in same manner as in Michigan, and the price per ton is $2, and 10 cents per 100 pounds.

I would also report that the American system prevails to a great extent in preserving foods and liquids in this district.

JEROME EDDY,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Chatham, Canada, January 22, 1890.

COATICOOK.

REPORT BY CONSUL ROBERTS.

Refrigerators are used in this consular district, but not to a large extent. A few of the leading families of the vicinity have them, and some of the grocers and meat dealers make use of them at their places of business.

No peculiar features are required. Those in use are manufactured in Canada. The sizes and formations are, I find, similar to those of the refrigerators in use in the New England States. A common size here is 18 by 36 inches. The prices of refrigerators in this vicinity are from $10 to $18.

In this consular district ice is secured by the use of tools similar in character to those used for the same purpose in the New England States. The price of ice to the consumer is 20 cents per 100 pounds.

On account of the usually short duration of the warm or summer season of each year in this portion of the Dominion, and on account, also, of the consequent small demand for the use of ice in the preservation of foods and liquids, this consular district, in my judgment, does not present a very inviting field for the introduction of American refrigera-

tors. The best manner of introducing them, however, would be, I believe, for the manufacturer to procure a hardware dealer in Coaticook, and also one in Rock Island (in the township of Stanstead), to act as agents for their sale.

FRANK W. ROBERTS,
Consul.

UNITED STATES CONSULATE,
Coaticook, January 13, 1890.

FORT ERIE.

REPORT BY CONSUL WHELAN.

In the consular district of Fort Erie refrigerators are pretty generally used, and about to the same extent, comparatively, and under like conditions, as in the States bordering on the Great Lakes. The features and styles embodied in the refrigerators manufactured and used in those States would entirely answer the requirements of this consular district. Those used here are manufactured in Brantford and other parts of the province of Ontario

The following tables give the sizes, description, and prices of the refrigerators used here.

Description.	Length.	Depth.	Height.	Price.
	Inches.	*Inches.*	*Inches.*	
Wood lined, bronze trimmings, oak-grained, casters	28	18	42	$11.00
Zinc lined, new patent latch, casters, thick wall	82	18	42	14.00
Zinc lined, hard wood, thick walls, bronze trimmings, casters.	26	17	40	15.00
Do	28	18	42	17.00
Do	80	19	44	19.00
Do	88	21	46	21.00
Zinc lined, bronze trimmings, locks and hinges, casters	84	20	46	24.50
Do	41	22	48	28.50
Do	47	23	50	88.50
Ice-chest, hard wood	80	22	80	10.00
Do	84	23	81	11.00
Do	40	25	32	18.00
Counter refrigerators: Ice-chamber, water-cooler, and tap; lower part, under ice-chamber has glass front ends, and forms a show-case for exhibition of butter or other provisions needing ice	24	24	27	18.00

In all these refrigerators, except the chest, the ice-chamber is on top.

The dealers get 25 per cent. off these prices, and the Canadian duty on refrigerators is 35 per cent.

Query: Can United States manufacturers compete?

Ice is secured here in the ordinary ice-house, just as in the United States, and is sold by the ton for from $2.50 to $3.00. It is retailed at the rate of 25 to 30 cents per 100 pounds.

JAMES WHELAN,
Consul.

UNITED STATES CONSULATE,
Fort Erie, February 10, 1890.

GASPÉ BASIN.

REPORT BY CONSUL DICKSON.

Refrigerators are almost an unheard-of piece of furniture in this district; even the stores and hotels do not use them.

Snow takes the place of ice in this district; the stores, hotels, and about all of the inhabitants have snow-houses on their premises.

The fresh fish that is shipped from here to the United States is packed in snow, which is deemed superior to ice, as it keeps the fish cool but does not freeze them.

There is no ice put up in this district to speak of; just a small amount, for the use of steamers that run here during the summer months.

In regard to the last clause of this circular, to report upon the best manner of introducing refrigerators into this district, I am unable to offer any encouragement in this line at present, for there are no cities or large towns in this district; the villages number from 200 to 500 inhabitants each. There is no such thing as an ice-cart delivering ice from house to house in this district.

ALMAR F. DICKSON,
Consul.

UNITED STATES CONSULATE,
Gaspé Basin, January, 1890.

LONDON.

REPORT BY COMMERCIAL AGENT LEONARD.

Upon diligent inquiry I learn that refrigerators are used only in cities and larger towns; there is rarely any demand for them in the country, owing, it is alleged, to the fact that most or quite all the farmers are supplied with good cellars and out spring-houses, with cool water running through the latter. There are no striking or peculiar features in construction different from those manufactured in the United States except in the matter of finish. Dealers say our refrigerators are more tastefully finished. Nearly, if not all, as far as I am able to learn, now being sold here are of home production. Formerly the Baldwin ice-chest, of Vermont, was sold in this market. A few also from some Buffalo manufacturer were sold here. None of either are now kept in stock, the whole trade being supplied by home manufacture. In size they correspond with those manufactured in the United States for domestic purposes. Some contain ice only on the top, others contain ice both top and body of chest ranging in price from $10 to $20, according to size and finish.

Ice is secured here in great abundance. It is taken from the north

branch of the Thames River and from spring ponds in the immediate vicinity of the city. The latter is much purer and better and sells at 12½ cents per 100 pounds.

I have made particular inquiry as to the possibility of introducing refrigerators where not now in use. I am told that it would be difficult for the reason already given. The farmers depend upon their cool cellars and out spring-houses. I will continue my investigations, and if I find anything of special note will report it promptly. I am inclined to think, from the favorable expressions made of American manufactures of ice-chests in their finish, that with proper effort there might be some increase of trade and preference given to our productions. I can not promise much with the home manufacturers looking up the trade, pressing sales, large and small, whenever they can.

H. Z. LEONARD,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
London, January 16, 1890.

KINGSTON.

REPORT BY CONSUL TWITCHELL.

Refrigerators are in general use in this consular district among the wealthy class of citizens. No peculiar features are required in their construction. Some of the refrigerators used are manufactured here; the largest proportion are imported from the United States; they are similar to those in New York State; price from $8 to $35.

Ice is cut from the harbor during the winter, and is delivered to customers at about 25 cents per 100 pounds.

WM. TWITCHELL,
Consul.

UNITED STATES CONSULATE,
Kingston, January 17, 1890.

MANITOBA.

REPORT BY CONSUL TAYLOR, OF WINNIPEG.

On account of the northern climate, refrigerators are used to limited extent only in this district in proportion to population. In the country, cellars where water is congealed during winter to a considerable depth and closed during summer are a very convenient substitute.

Ordinary patterns and grades of refrigerators as used in United States are occasionally manufactured here, but are mostly brought from Toronto, Brantford, and London in Eastern Canada. Those generally

in use are of the following dimensions: 41 by 33 by 21 inches, price $18; 41 by 40 by 21 inches, $20; 48 by 46 by 21 inches, $25.

The duty by the Canadian tariff on refrigerators, classified as "furniture," is 35 per cent. ad valorem.

Ice is readily secured in all parts of Manitoba and elsewhere in this consular district, price $1 per ton; delivered and distributed in summer by ice companies to families at $5 per season of five months at 10 pounds daily, and larger quantities at less rates.

JAMES W. TAYLOR,
Consul.

UNITED STATES CONSULATE,
Winnipeg, June 14, 1890.

MONTREAL.

REPORT BY CONSUL-GENERAL KNAPP.

Refrigerators are used in this consular district, their use, however, being mostly confined to the cities and villages. As to just what extent they are used it is impossible to state. The climate here during the greater part of the year is so cold that refrigerators are not in such demand as they are in a warmer climate. Still they are used here to a considerable extent and their use is increasing.

I am unable to find that there are any peculiar features required in their construction.

The refrigerators used here are mostly manufactured in Montreal, Ottawa, and Brantford, Canada.

The principal manufacturers in Montreal are George W. Reed and Joseph E. Barill. Some refrigerators are also imported from the United States, those so imported being manufactured principally by the Jewett Manufacturing Company, Buffalo, N. Y., and by the Baldwin Manufacturing Company, Burlington, Vt.

The refrigerator most in use here is the North Star refrigerator, manufactured in this city.

To secure an equable cool temperature throughout this refrigerator the ice compartment is placed in the top, thus allowing the cold air to descend from the ice.

To effect a thorough circulation as well as ventilation, a current of air is created and passed through by means of ventilators on the sides. (and which are used to regulate this at pleasure) into the air-chamber, from whence it enters into and circulates throughout the compartments, making its exit on the opposite side to which it enters through similar air-chambers and ventilators.

The shelves are made of galvanized-iron wire, which does not rust, and the rack is covered with zinc. This last not only protects the bot-

tom of the ice-box but also serves to keep the ice free from its meltings, and economizes.

This refrigerator is manufactured in different sizes, with prices varying according to size.

Width.	Depth.	Height.	Price.
Inches.	*Inches.*	*Inches.*	
35	22	45	$23.00
38	23	47	26.00
41	24	49	30.00
44	25	51	35.00
48	26	53	40.00

The North Star refrigerator is, as stated above, the one principally used in this district; other refrigerators used to some extent do not vary materially from the one above described in sizes and prices, and while in formation they may differ somewhat, they are of ordinary construction, with no peculiar features characterizing their formation.

Ice is secured in this consular district principally from the rivers St. Lawrence and Richelieu. The ice secured by ice companies is furnished to customers at 29 cents per 100 pounds.

CHAS. L. KNAPP,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Montreal, February 6, 1890.

NOVA SCOTIA.

REPORT BY CONSUL-GENERAL FRYE, OF HALIFAX.

Refrigerators are in use in Nova Scotia to a moderate extent. There are no peculiar features required in their construction for this province. Most of the refrigerators sold in Nova Scotia are manufactured in some part of Canada—some in this province and some in Ontario. A few are or have been imported from the United States, and they are said to be better finished than the Canadian make; but owing to the Canadian duty, which is 30 per cent. ad valorem, they can not be sold at a profit in competition with those manufactured in Canada.

The sizes most in use for domestic purposes are: Width, 2 feet 6 inches; height, 44 inches. They are similar in arrangement and appearance to the American refrigerators, different styles being used, and are sold for about the same price that the American article sells for in the United States.

Ice is easily secured in winter in this country wherever there are streams or fresh-water lakes, which are abundant. The ordinary price of ice, per ton, is about $1.50. This season, owing to the greater demand abroad, the price is about $2.50. By the 100 pounds it is sold for 25

cents. Families using moderate quantities during the warmer seasons of the year, obtain it for from $3 to $6 per season, according to the quantity used.

Ice is stored to considerable extent in winter both for shipment and for domestic use. Some families who do not use the refrigerators have small houses or large closets, in which a supply is kept for daily use in summer. I doubt if these store-rooms or closets are constructed on modern or improved plans. In one of the meat-markets in Halifax, however, a large apartment is now being constructed by a professional builder of refrigerators from Boston, who has constructed several of them in other parts of the Dominion. It will cost about $1,500, and will be a decided improvement upon anything of its kind in this city, if not in this province.

It is not probable that under the present Canadian tariff American refrigerators can be successfully sold here, unless the manufacturers can furnish them cheaper than at their present prices. To find a market the refrigerators must be of better appearance, finish, and quality, and as cheap, or nearly as cheap, as the Canadian article. Purchasers unacquainted with refrigerators can not always judge what kinds possess the best preserving qualities, and are apt to buy the cheaper article, provided it looks well and appears to be convenient in its arrangements. The only way, therefore, to find a market here for the American refrigerator would seem to be to place the very best article in the market at the lowest price, and to advertise it liberally. In the hands of enterprising and competent agents they might, and I believe would, find some sale here. Like many other luxuries the refrigerator becomes a necessity, as people become accustomed to its use and learn its value.

WAKEFIELD G. FRYE,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Halifax, April 3, 1890.

OTTAWA.

REPORT BY CONSUL-GENERAL LAY.

Refrigerators are largely used in this consular district for domestic purposes and by butchers, brewers, pork-packers, green grocers, hotels, restaurants, etc.

Those in use are mostly box-shaped, with sides of wood, having spaces filled with non-conducting material and dead air spaces. The ice-box is on top or on the side, and the air is drawn through ventilators, passing over the ice and descending to the storage chamber. One style in rather general use here is the "Hauraleau" patent, which is similar to the American "Lorillard" patent. They are manufactured for domestic purposes in the principal cities, Toronto and Ottawa. Cold-storage

houses are put up and used in Morrisburg, Iroquois, Prescott, Brockville, and Kingston, usually for the storage of butter and eggs, meats, etc., where ice is cheap and from whence large shipments are made.

The sizes, formations, and prices of the refrigerators in use are as follows: 36 by 32 by 18 inches, ash, $20; 42 by 32 by 18 inches, ash, $25; 48 by 34 by 21 inches, ash, $30; 48 by 40 by 27 inches, ash, $40; 72 by 54 by 30 inches, ash, $60.

The above is the ordinary domestic refrigerator, box-shaped. Special sizes are made for hotels, restaurants, etc.

Ice is usually sawn into blocks 3 feet long. It is then packed in large ice-houses; price, put in, from 35 to 50 cents per ton, according to distance of haul. Price of ice at retail, in summer, about 40 cents per 100 pounds.

Comparing the American system with the Canadian, it is claimed here that Canada has an equally good one. But it can hardly be said that perfection has been attained in the consumption of ice, in the even distribution of air, in the carrying off of noxious gases generated by articles of food, or in the perfect dryness of the air. There have been about fifteen Canadian patents issued for refrigerators within the past ten years.

Refrigerators are used very universally except in the country districts. Nearly every household goods dealer is an agent for some refrigerator, and no one style possesses sufficient merit to become universally adopted.

The best manner of introducing refrigerators into this district would be to have reliable traveling agents to visit important cities and towns and select household dealers, like the companies do here, and give them a liberal commission for a time to sell them; also, to show the refrigerators at the agricultural fairs which are held, annually, in the fall; also, by a judicious system of advertising.

RICHARD G. LAY,
Consul-General.

UNITED STATES CONSULATE GENERAL,
Ottawa, February 6, 1890.

PORT HOPE.

REPORT BY COMMERCIAL AGENT SHAFFER.

Refrigerators are almost universally used in hotels, butchers' stalls, and private houses. No peculiar features required in construction, except those mentioned below.

The refrigerators in use in this district are manufactured in Toronto and in Michigan. Hotels and private houses use the Leonard refrigerator, for the most part, manufactured in Michigan.

The sizes are 8 by 10 and 12 feet in height, according to the business for which they are required.

Butchers use 12 by 14 by 14 feet high; they are double lined with felt paper between the boards.

Fruiterers and fish dealers use a smaller size with an outer and an inner "skin" 2 inches apart, and this space is filled with charcoal; a part of the top portion is reserved for ice, and on the sides there are spaces for the cold air from the ice-chamber to enter the refrigerator; and in the rear there is a warm air-chamber for carrying off the warm air.

The cost is from $250 to $600.

Average sizes, 27 by 18 by 42 inches, $16; 30 by 20 by 45 inches, $22; 36 by 21 by 48 inches, $30; 40 by 24 by 50 inches, $40; 43 by 26 by 60 inches, $50; 48 by 25 by 45 inches (drawing-room style), $75.

The ice is secured from the rivers and lakes by cutting it with a cross-cut saw into blocks 2½ feet long and 1½ feet wide. It costs the consumer 50 cents per 100 pounds.

Generally, I think the people are familiar, in this district, with the various kinds of American refrigerators, and if they do not adopt them it will not be from ignorance of their superiority.

LUTHER M. SHAFFER,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Port Hope, January 30, 1889.

PORT ROWAN.

REPORT BY COMMERCIAL AGENT SCHOOLEY.

Refrigerators are in use in this consular district only to a limited extent. There are no peculiar features required in the construction. They are manufactured principally in Toronto, Hamilton, and Brantford.

Sizes and prices are as follows: From 24 to 40 inches in length, 18 to 20 inches in depth, 27 to 45 inches in height; generally of square design; from $11 to $30 for ordinary house use.

Ice in this district is cut from ponds. The price is $1 per load, delivered in ice-house, each load containing about 1½ tons. It is generally retailed to customers for the season, ranging from $2 to $15 and $25, according to the quantity used.

I may here add that many private houses have their own ice-houses and they are greatly utilized. In many cases ice-chests, simply made of wood and lined with zinc, are largely used. As there are only villages and towns, there being no cities in my district, refrigerators are not used to such an extent as in the cities. A good deal of dependence is also placed in the cellars, they being built with a due regard to the preservation of foods and liquids.

As to introducing refrigerators into this district, the greatest drawback is regarding prices; there being also a duty of 35 per cent. which makes it almost prohibitive.

R. H. SCHOOLEY,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Port Rowan, Januarg 21, 1890.

PORT STANLEY AND ST. THOMAS.

REPORT BY CONSUL QUIGGLE.

Refrigerators are used in this consular district to about the same extent as in similarly situated parts of the United States. There are no peculiar features required in their construction other than those ordinarily found in American-made refrigerators. They are manufactured at Toronto, London, Brantford, and Harriston, in the Province of Ontario; sizes and formations are about the same as standard American refrigerators. Prices range from about $10 to $25, retail. It is seldom that any are sold at a higher figure than the latter.

The mode of securing ice is so obvious in this northern latitude as to require no explanation. The price of ice in the summer season is usually from 12 to 15 cents per 100 pounds.

The best manner of introducing refrigerators into this district would be by furnishing dealers with descriptive catalogues and placing the prices so low, and making the discounts so liberal, that they could afford to pay the Canadian duty of 35 per cent. ad valorem and sell them as cheap as those of domestic manufacture.

JAMES C. QUIGGLE,
Consul.

UNITED STATES CONSULATE,
Port Stanley and St. Thomas, January 17, 1890.

ST. HYACINTHE.

REPORT BY COMMERCIAL AGENT MOORE.

Only the smaller sizes of refrigerators are used here by private families. In stores large ice-boxes, constructed like those you would find in every meat or provision store in the United States, are not in general use; if there are any, they are constructed after their own plans and are merely large boxes.

In the market here, where meats are sold on every Saturday, there are no ice-boxes or cold storage. The butchers take their meat which is unsold and put it in the large cold-storage rooms (of an American firm

of egg packers here), made after plans by Mixer & Co., American refrigerator makers. They are charged one-half cent per pound for this privilege and keep their meat there until the next market day.

There are no peculiar features required in the construction of refrigerators for this district. Those in use are manufactured in the province of Ontario.

The prices, etc., given here are taken from the price-list of the manufacturers of refrigerators on sale here, Messrs. Gould & Knowles, Brantford, Ontario. The measurement is the outside measurement.

Description.	Length.	Depth.	Height.	Price.	Shipping weight.
	Inches.	*Inches.*	*Inches.*		*Pounds.*
Cheap grade	28	18	42	$10.00	160
Medium grade	26	17	40	14.00	140
Do	28	18	42	16.00	160
Do	30	19	44	18.00	175
Do	33	21	46	20.00	200
Best grade	34	20	46	23.00	215
Do	41	22	48	17.00	255
Do	47	23	50	32.00	318
Ice-chests	30	22	30	9.00	146
Do	34	23	31	10.00	160
Do	40	25	32	12.00	180
Counter refrigerator, glass side for show-case	24	24	27	12.00	146

Ice is cut from the river on which the town is situated; nearly every person has his own ice-house, which he fills himself.

It is never sold by the pound, but ice men charge $8 for the season of five months, delivering 20 pounds daily.

The best manner to introduce refrigerators would be to place them in the hands of some merchant here, or else send a commercial traveler, and by judicious advertising.

THOMAS EWING MOORE,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
St. Hyacinthe, February 3, 1890.

ST. JOHNS, QUEBEC.

REPORT BY CONSUL FISK.

Refrigerators are generally used in this district. No peculiar features required. A refrigerator that is good for New England would be good for this district.

Those in use here are manufactured at Brantford and London, Ontario, Montreal, Quebec, and to some extent at Burlington, Vt.

The formations are quite like the refrigerators in common use in New England. The ice compartment is generally in the top. Single and double doors are used, with zinc or wood for lining. In some, to effect a thorough circulation and ventilation (as claimed), a current of air is

created and passed through by means of ventilators on the sides into the air-chamber, from whence it enters and circulates throughout the compartments.

Prices.

	Length.	Depth.	Height.	Price.
	Inches.	*Inches.*	*Inches.*	
No. 1	34	20	46	$23.00
No. 2	41	22	48	27.00
No. 3	47	23	50	32.00
No. 10	60	28	68	45.00

Ice is secured from the streams. The price is about 20 cents per 100 pounds.

H. C. FISK,
Consul.

UNITED STATES CONSULATE,
St. John's, Quebec, February 10, 1890.

ST. STEPHEN.

REPORT BY CONSUL GOODNOW.

Very few refrigerators are used in this district, and those in private families, they are of all kinds, sizes, and of local manufacture; there is no demand at present for them.

Ice is cut on this (St. Croix) river 2 miles above the town, hauled here by teams, and stored at an expense of 50 cents per ton; in summer time it is sold for 50 cents per 100 pounds.

EDWARD C. GOODNOW,
Consul.

UNITED STATES CONSULATE,
St. Stephen, January 30, 1890.

SHERBROOKE.

REPORT BY CONSUL WHITE.

Refrigerators are used in this consular district very generally, more perhaps than would be natural to suppose in a latitude as far north as this is, and where there is but very little warm weather compared with other sections of the country.

There are no peculiar features required in their construction. It is safe to say that fully 75 per cent. of them are manufactured in the United States.

As an invariable rule, the size and formation consist of the ordinary size and style in general use by private families, hotel proprietors, dairy

and market men throughout the eastern and northern part of the United States, which are so well known that I deem it inexpedient and unnecessary to enter into a detailed account and description of the construction of these ordinary house and market refrigerators.

In some countries where there is an extremely warm climate the year round, it has been proved and demonstrated that ice can be manufactured by an artificial process much cheaper than to transport it from colder countries, but in a country like this, where, during the winter months, the temperature is so cold that the mercury ranges at times as low as 45° below zero, there seems to be no occasion to resort to artificial means to secure ice in this immediate locality. It is cut and taken from the rivers, ponds, and lakes in this localty at a cost of about 40 or 50 cents per ton and preserved in ordinary ice-houses.

Ice-dealers furnish ordinary private families for \$5 a season and charge hotel and market men and other parties using a large quantity at the rate of \$2.50 or \$3.00 a ton.

D. M. WHITE,
Consul.

UNITED STATES CONSULATE,
Sherbrooke, March 13, 1890.

THREE RIVERS.

REPORT BY CONSUL SMITH.

Refrigerators are in general use in this consular district.

So far as I can learn there are no peculiar features in their construction. They are manufactured in this city.

They are of all sizes; prices range from \$18 to \$50.

While those in use here are generally inferior to those manufactured in the United States, the climate, even in mid-summer, is so cool and the people are so poor, that I can offer no encouragement to American makers to attempt the introduction of their wares.

NICHOLAS SMITH,
Consul.

UNITED STATES CONSULATE,
Three Rivers, December 2, 1889.

MEXICO.

GUAYMAS.

REPORT BY CONSUL WILLARD.

Refrigerators are used to a very limited extent in this consular district. The few that are used are of American manufacture, but the whole number imported for the past five years will not exceed thirty.

There is no system of preserving food in this part of Mexico beyond that practiced from the early days of the settlement of this coast, viz: drying in the open air the flesh of animals, the atmosphere being such that in three days' exposure to the sun it is perfectly dried. The same is then made into bales or packages and will keep from one to two years.

The ice which we have in this part of Mexico is made artificially; there are but two ice-machines in this consular district; one at Guaymas of the capacity of 5 tons daily. The consumption in the summer months, from June to November, is 3 tons per day. The ice-machine at Hermosillo (capital of Sonora) has the same capacity, and the consumption is about the same as at Guaymas. No ice is imported from the United States as a regular business. Price in Guaymas per pound 2½ cents; in large quantities, 1½ cents.

The preservation of liquids has not been attempted.

Regarding the best manner of introducing refrigerators into this district, I am unable to give a clear idea; the people still pursue the old-time custom of their forefathers, and although this consular district borders on the United States, with daily railway communication, no change, excepting to a limited extent, has been made in the manner of living, and no new system of preserving food and liquids attempted. There are no canning establishments for the preservation of either beef or fish in this consular district.

A. WILLARD,
Consul.

UNITED STATES CONSULATE,
Guaymas, March 1, 1890.

LA PAZ.

REPORT BY CONSUL VIOSCA.

While this country is so utterly unprovided with the facilities for procuring ice enough during summer to satiate the craving appetite of one-third of its consumers, and that at the enormous price of from 12

to 25 cents per pound at which it is sold, when any of it from across the Gulf has reached the market, it becomes thus impossible to make a report of any utility to the manufacturers on the refrigerator subject.

JAS. VIOSCA,
Consul.

UNITED STATES CONSULATE,
La Paz, February 1, 1890.

PASO DEL NORTE.

REPORT BY CONSUL SAMPSON.

Very few refrigerators are used in this consular district.

Ice is secured from the Artificial Ice Company of El Paso, Tex. Price, 75 cents per 100 pounds.

A. J. SAMPSON,
Consul.

UNITED STATES CONSULATE,
Paso del Norte, February 20, 1890.

TUXPAN.

There being neither ice nor machines for its manufacture in this district, refrigerators could not be sold in this market.

JOHN DRAYTON,
Consul.

UNITED STATES CONSULATE,
Tuxpan, January 18, 1890.

CENTRAL AMERICA.

COSTA RICA.

REPORT BY CONSUL MACKEY, OF SAN JOSÉ.

Refrigerators are used in Costa Rica to but a limited extent, their use being confined to the capital, San José, and the two ports Punta Arenas and Limon.

The latter places are small, neither exceeding more than 2,500 inhabitants. San José has a population of 25,000, but the standard of comfort is not sufficiently high to bring refrigerators into general use. They are used principally in the drinking saloons and retail grocery stores of the towns mentioned.

There are no peculiar features required in their construction for this district.

Those in use are manufactured in New York or San José.

Only the smaller sizes are used, and those of the simplest form. Those manufactured here hold, as a rule, 5 pounds of ice; those imported are made to hold from 25 to 30 pounds. The cost of the former is $10, United States currency; of the latter, about double that sum.

There are ice factories in San José and Punta Arenas, and consumers are supplied daily with the ice required at a cost of 1½ cents (United States currency) per pound.

My reply to the Department's circular is brief, for the reason that the trade here in refrigerators is insignificant, and likely to continue unimportant, on account of climatic and social conditions.

BECKFORD MACKEY,
Consul.

UNITED STATES CONSULATE,
San José, February 10, 1890.

NICARAGUA.

BLUEFIELDS.

REPORT BY CONSULAR AGENT SIMMONS.

"No" and "none" are the only replies I can make to interrogatories 1, 2, 3, 4, and 5 of the refrigerator circular.

During the past two years the writer has industriously sought, for his personal needs, an apparatus for the preservation of foods and liquids, one that should cheaply maintain a sufficiently low temperature, and

not necessarily for production of ice, for which the demand is not enough to warrant the expense of machinery. To the very many letters of inquiry sent to all parts of the United States circulars only were received in reply, representing machines for making ice; expensive, involving employment of steam-engines, and skilled labor to conduct them.

One ton of ice per week would at present fully supply all demands, and its price must not exceed 5 cents (*soles*) per pound to insure the sale of so much. What is wanted are refrigerating apparatus for the preservation of meats, etc., and cheap enough to meet private needs, machines that will maintain a uniform temperature of 38° to 40° Fahr. One such on a large scale would meet all town requirements and serve to promote the sale of meats, poultry, etc., of American importations. Facilities for the introduction of everything needed are furnished by steam lines from the ports of New Orleans, Savannah, Philadelphia, and New York.

JNO. H. SIMMONS,
Consular Agent.

U. S. CONSULAR AGENCY,
Bluefields, January 25, 1890.

MANAGUA.

REPORT BY CONSUL WILLS.

Refrigerators are used to such a limited extent in my consular district that I can not say they are used at all.

The ice company brought in a few refrigerators, with the materials for their factory, duty free; finding no demand for them, they were put upon the market below cost. The price paid was $21; they were offered at $15, but not sold.

Another gentleman has lately imported fifteen, costing from $3 to $15 each. He finds no sale for them.

They are manufactured by Macy & Co., New York.

Ice is manufactured only in Managua, and shipped to the different towns. The wholesale price at the factory is $2.50 per 100 pounds, but it is retailed by special agents at 5 cents a pound. Parties using ice buy a pound at a time, generally before each meal.

Perishable goods are purchased only in sufficient quantities for the day. The markets are open every day, including Sundays.

CHAS. H. WILLS,
Consul.

UNITED STATES CONSULATE,
Managua, April 15, 1890.

SOUTH AMERICA.

ARGENTINE REPUBLIC.

REPORT BY CONSUL BAKER, OF BUENOS AYRES.

I am in receipt of the circular of the Department of State asking certain information in regard to the use of refrigerators in the Argentine Republic, with a view to extending the trade of American manufacturers of such articles in this country.

In reply I have to state that the people of this Republic fully appreciate the value and convenience of the American refrigerators, and for a number of years, ever since the manufacture of artificial ice was commenced in this country, these articles have not only been imported here, but they have found a very ready and increasing sale. Now, not only are they used by hotels, cafés, eating-houses, *confiterias*, and drinking saloons generally, but in all the dwelling-houses of the wealthier classes.

I know of no particular features which are required in their construction to meet the tastes of this community, but you will see in use all the various shapes and sizes, from the mere ice-box to those which have the pretentions of a sideboard. As, however, ice is an expensive article of luxury, I suppose those whose construction requires the smallest quantity and least consumption of ice would be preferred.

There may be some few refrigerators imported from other countries, but the great bulk of those on sale here are from the United States.

In regard to sizes, formations, and prices, there is nothing that I can say further than that these depend on the requirements, the tastes, and the means of those who purchase them, just as is the case in the United States.

The great drawback to the universal use of refrigerators in the Argentine Republic is the fact that there is no natural ice here, and no importations from northern latitudes. All the ice used is manufactured; and while the quantity is every year growing larger and the quality is equally being improved, yet the expense is so great, other things being considered, that it is only those with somewhat plethoric purses who can indulge in its general use. Two years ago the price was 90 cents per 25 pounds, but, owing to increased facilities in its manufacture, you can now buy a very good quality for from 2 to 3 cents per pound for large quantities. At retail, from the groceries, it sells for 5 to 8 cents per pound, according to the demand. These prices are in Argentine paper money, which, reduced to gold, would make the price of ice about 1 cent per pound for large quantities, and 2½ to 4 cents per pound at retail, estimated in United States coin.

A few years ago the attempt was made to import ice from the United States to Buenos Ayres, but it proved to be a failure owing to the fact that sea-going vessels at that time were obliged to anchor about 8 miles from the shore and have their cargoes transferred to lighters; so that with such exposure under a fervent sunshine ice cargoes melted about as rapidly as they were delivered. But since then a great change has been effected in the handling of cargoes here. Now Buenos Ayres has a good and convenient harbor, where vessels discharge alongside of commodious wharves or docks without delay and without trouble; and it seems to me, if parties should first make arrangements for ice deposits on these docks, that it would be a paying business to import ice to Buenos Ayres from the United States. I think there is no doubt that it could be delivered from the United States much cheaper than it can be manufactured here. Thus, with its more general use owing to greater cheapness, there would be an increased demand for American refrigerators.

E. L. BAKER,
Consul.

UNITED STATES CONSULATE,
Buenos Ayres, *February* 12, 1890.

BOLIVIA.

REPORT BY CONSUL-GENERAL ANDERSON, OF LA PAZ.

My personal knowledge of the demand for refrigerators is confined to the department of La Paz, in which I have my official residence, not having visited either of the other seven departments of Bolivia, viz: Cochabamba, Potosi, Chuquisaca, Oruro, Tarija, Beni, and Santa Cruz. With the exception of the province of Fungas, lying in the northeast of this department and beyond the great Cordillera range, and a portion of the province of Cercada, lying south of this city some 8 leagues, and in the low valleys of the La Paz River, there is no demand whatever for refrigerators in the department of La Paz, owing to the favorable climatic conditions resulting from its varying altitudes of from 10,000 to 13,000 feet.

Here, as well as throughout the great departments of Potosi, embracing nine provinces, and Oruro, embracing three provinces, foods and liquids are kept in perfect preservation for from five to eight days in summer and from eight to twelve days in winter, by simply exposing them to the fresh air. The three departments to which I refer fall within the chief mountain districts of Bolivia, and embrace the great body of the population of the Republic.

The departments of Beni and Santa Cruz, lying still beyond the province of Fungas, have a climate similar to that of Fungas, but are so remotely situated and sparsely settled that neither offers an inviting field for the line of American goods referred to, although climatic conditions are favorable to their introduction. The departments of Coch-

abamba and Tarija embrace within their extensive limits a large number of low, warm, and exceedingly rich valleys, the products of which soon perish, as I am informed, for want of some adequate system for their preservation. The remaining department of Chuquisaca has a temperate climate as a rule.

The rural portion of this department is sparsely settled, the great bulk of the population living in Sucre, not only the capital of the department but of the Republic. It is apparent, therefore, from what I have here stated, that there is no general demand for refrigerators in this country; that the demand therefor, so far as the climate is concerned, is confined to the warm districts I have enumerated. The introduction of refrigerators into these districts is, in my judgment, an experiment worth trying.

A vast amount of the products of these sections of the country perish for lack of the American system of preserving foods and liquids. If, however, the manufacturers of refrigerators in the United States undertake this experiment they must do it in the light of the fact that the Indians are the producing class in this country, and that the introduction of modern appliances to take the place of their primitive methods of labor is regarded by them, as a rule, as an innovation not to be encouraged.

As to the manner of securing ice and its price per hundred pounds, I have to report that the supply of ice here at all seasons of the year is unlimited. The famous Illimani, which reaches an altitude of more than 23,000 feet, and other great peaks of the Andes system are not only perpetually covered with snow, but abound in solid beds and columns of ice as well.

The Indians climb to these mountain heights and, cutting the ice into blocks, lash them across the backs of llamas, and, with these celebrated burden-bearers of the Upper Andes, each carrying not exceeding 100 pounds, the limit of their ability as pack-animals, they descend, as sure of foot as the llamas themselves, to the ice markets of the country, where they sell it at from 20 to 40 cents per 100 pounds.

T. H. ANDERSON,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
La Paz, March 15, 1890.

BRAZIL.

RIO DE JANEIRO.

REPORT BY CONSUL-GENERAL DOCKERY.

Replying to the Department's circular of date November 25, 1889, asking information in regard to the use of refrigerators in this consular district, I beg to report that after careful investigation I find that they

are now used in this city to a limited extent. The demand, however, is slowly increasing each year, and 200 to 300 will probably be sold this season. Those in use are principally imported from the United States, are small, cheaply constructed, and sell here for $10 to $50. No higher-priced article can now be sold here, but as the demand increases more costly ones can be introduced. Ice is manufactured here and retailed at 2½ to 3½ cents per pound. As a local company secured and now holds valuable concessions and exclusive privileges for cold-air preservation which are not now in use, the chances for the successful introduction of any other method are not good at present.

Up to now, the supply of articles of food has been for the day only, but, with facilities to keep it, a change of custom may reasonably be looked for. Ice having been put on the market at a figure placing it within the reach of the people, from being a luxury it will come into general use, and with that will come the increased demand for refrigerators.

My conclusions are that a market can be opened here for the successful introduction of American refrigerators. To do so will require a careful study on the part of our manufacturers to produce such goods as will suit the trade. A large stock of the manufactured article should be brought here and considerable money spent in advertising and pushing the sale. I believe the result will come slowly, but very satisfactorily.

I shall refer more fully in a general dispatch to the necessity of our manufacturers becoming more thoroughly acquainted with and adapting their products to the wants of this market if they would enter into competition with the English and Germans. A splendid opportunity is now presented.

O. H. DOCKERY,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Rio de Janerio, February 15, 1890.

BAHIA.

REPORT BY CONSUL BURKE.

As to information concerning refrigerators, as called for in the circular dated November 25, 1889, I have the honor to say but very little can be given, as the use of this article in this place is confined to the hotels and a few restaurants. Not a half dozen were imported during the past year. They are almost an unknown quantity in private houses. One may be found here and there, but they are so little used that hardware merchants do not keep them in stock. In one of the large hardware stores I found one, which the merchant had imported on order from England. This and another one made up his entire importation of refrigerators for the year 1889. It was a small one, perhaps 2½ feet

square; retail price, 40 milreis ($21.84); constructed much the same as American refrigerators of the same size. It was lined with zinc inside, with a place for depositing the ice, and shelves that were movable, making the space between them larger or smaller according to size of the articles placed within.

I saw one of a German make, size about 4 feet in height, 4 in length, and 2½ in breadth. At the top of this was the ice-chest, extending through its length and breadth dimensions and about 6 inches in depth. Underneath this ice-chest were the slides and the shelves, the shelves being movable. Below the ice-chest are two partitions, or, rather, two compartments, with a partition running up and down through the center of the refrigerator. In this partition is a faucet to draw the water from the ice-box. The interior of the refrigerator is lined with zinc. The cost of this refrigerator, when exchange was high, was 120 milreis ($65.52), laid down here in Bahia. The freight on it was 28 milreis ($15.29), and the duty 38 milreis ($20.77), together with other expenses, making, as mentioned above, 120 milreis all told. England and Germany furnished the very few that are here.

The prevailing opinion among Brazilians is that it is unhealthy and injurious to use ice in this climate. Even many foreigners hold the same opinion and rarely use ice. Those families that use ice buy it late in the afternoon as the ice-cart goes through the city, place the ice bought in a small box of saw-dust when the ice is used at dinner, which takes place from 6.30 to 8 p. m.

From one to three kilos is the quantity purchased by those families that use it. By families it is not used at all to preserve foods.

As meats can be bought at any time of the day and fruit also, no more of anything is purchased than is required for the day; therefore in such cases the refrigerator is dispensed with. Canned goods are also very largely used.

Ice is very expensive, selling at 200 reis, about 10 cents, per kilo, or say 5 cents per pound.

Yet I do not think it is the price of the ice that prevents people from using it more extensively, but because its use, as I said, is regarded as being unhealthy and injurious. But perhaps the chief reason why families do not use refrigerators is because they never have used them and can not appreciate how good a thing it is to have them. As far as I can learn no special effort has ever been made to introduce them and merchants sent for them only on order simply, because there has not been nor is there to-day any demand for them.

The first thing to do if any business is expected is to create a demand for them. This can be done only, it seems to me, by showing families how good, useful, and necessary a thing a refrigerator is.

If this could be done and ice drop one-half in price, there would be a sale for refrigerators.

And I do not know of any better method of introducing this article than by a sort of canvassing tour amongst the business men and men

of leisure. To canvass from house to house would hardly do. Either that method or the establishing of an agency here with refrigerators on hand all the time, making a strong effort to work up the trade to create a demand.

I think our American refrigerators, just as they are manufactured, are adapted for this climate. The only thing is to show the people the advantage of such an article in preserving goods and liquids, and that ice, though expensive, is not injurious if taken with moderation, and that a refrigerator may be both "a thing of beauty and a joy forever," especially in a hot climate.

Should any manufacturers desire to correspond with any firm here on the subject of taking the agency, offering terms, inquiring for terms, etc., I would recommend the firm of Corta Santos & Co. But the correspondence should be in Portuguese.

DAVID N. BURKE,
Consul.

UNITED STATES CONSULATE,
Bahia, March 15, 1890.

PERNAMBUCO.

REPORT BY CONSUL BORSTEL.

No refrigerators are used in this consular district, except a few hotels that are provided in that way.

The few in use at the hotels are manufactured in the United States at Burlington, Vt.

The Baldwin refrigerators, size 2 by 1.8 and 3 feet high, price $[illegible]0. The Macey Diamond refrigerator, size 2.6 by 1.8 and 3 feet high, price $22.50. An ice-chest for cooling beer or wine, showing no marked name, price $16.50.

All ice here is artificially made by machinery; price per 100 pounds, $2.50.

Meats and fish can not be preserved more than one day in this hot climate, hence the little use made of refrigerators.

I have not the least doubt that the American refrigerators could be introduced here by an energetic man who would canvass from house to house for the sale of same, but he must speak Portuguese, and not become soon disheartened if he does not meet with success at first; it is almost impossible to get the people here interested in anything even if it is to their benefit.

It would be impossible for one to make any suggestions in regard to modifying the American refrigerators to meet local requirement, because, not being in the business, I have never given the subject any attention.

H. CHRISTIAN BORSTEL.

UNITED STATES CONSULATE,
Pernambuco, January 30, 1890.

BRITISH GUIANA.

REPORT BY CONSUL WALTHALL, OF DEMERARA.

Refrigerators are in general use in this colony, though to what extent I am unable to ascertain with accuracy.

No peculiar features are believed to be required in their construction.

So far as ascertained they are exclusively of American manufacture, and I am informed that the "Eureka" refrigerator and the "Diamond" ice-box are the kinds of which most have been sold. The sizes and prices vary.

The ice trade is at present in the hands of a firm (Messrs. Birch & Co.) who have a contract with the Government, by which they are required to furnish it, whether in larger or smaller quantities, at a uniform price of 1 cent per pound. On the other hand, the Government accords them the exclusive privilege of supplying the Government offices, hospitals, and other public institutions. They are bound to keep on hand at all seasons a sufficient supply for these purposes, and in case of failure are liable to a fine for every day of the deficiency. As regards the supply for private individuals and families, the business is open to competition, but although supposed to be in contemplation, no such competition has as yet been set on foot.

W. T. WALTHALL,
Consul.

UNITED STATES CONSULATE,
Demerara, February 20, 1890.

CHILI.

IQUIQUE.

REPORT BY CONSUL MERRIAM.

Refrigerators are used in this consular district to a very limited extent, their use being confined to the hotels and a very small number of well-to-do families.

No peculiar features are observed in the refrigerators here used, nearly all of which are imported from England and Germany.

The sizes vary from 2 to 3 feet in height, of about the same length and width, and are sold for from $20 to $40 American gold, or its equivalent in Chilian currency.

The ice consumed in this city is all manufactured by a German, who has no opposition or competition in the business, and who sells it in rectangular cakes at the rate of $10 (Chilian currency) per quintal of 100 pounds, or say $5 American gold, although, in fact, the quintal of ice never weighs more than 80 pounds.

Were there competition in the manufacture of ice and a consequent reduction of, say, 50 per cent. in the price, its consumption would, doubtless, be much increased, and there would be a corresponding increase in the use of refrigerators.

This is not a promising field for the introduction of refrigerators under the present conditions of ice manufacture.

J. W. MERRIAM,
Consul.

UNITED STATES CONSULATE,
Iquique, February 28, 1890.

TALCAHUANO.

REPORT BY CONSUL VAN INGEN.

All the ice used in this part of the country is brought down from the Andes, which are close by, in carts to the nearest railway station and thence transshipped to destination; but the quantity is very insignificant and is only for household use. There are no refrigerators used here.

All the preserved food and liquids used here are imported.

JOHN F. VAN INGEN,
Consul.

UNITED STATES CONSULATE,
Talcahuano, March 27, 1890.

DUTCH GUIANA.

REPORT BY CONSUL BROWNE, OF PARAMARIBO.

The articles that come nearest to refrigerators, in use in this colony, are ice-chests, which are imported here from Boston, and by Mr. A. N. Bixby.

There is no particular feature that I know of required in the construction of refrigerators for this district.

The ice-chests in use in this district are manufactured in the United States and in Holland.

The size of the ice-chests in use here is as follows: Length, 2½ feet; width, 20 inches; height, 2 feet; thickness of box, 3 inches.

Ice is imported in this colony from Boston by Mr. A. N. Bixby, shipping merchant, and is put up in an ice-house built according to the principle of those in use in the United States.

The price per 100 pounds of ice is $3. Price of the ice-chests, $10.

I would state, for the information of the manufacturers of refrigerators in the United States, that in this district we have only one city, and that is Paramaribo, which place has a population of 27,000, and of that number, to the best of my opinion, there are not more than from 400 to 500 people who use ice.

Nine-tenths of the population are poor and can not afford to purchase a refrigerator.

In regard to the preservation of food, the people here only buy enough to last from day to day, so that there is no danger of it spoiling in that length of time.

I think the best means for the manufacturers in the United States to introduce their refrigerators in this colony (that is, if they should think well of doing so, after reading this report) would be to send an agent down here with samples of the different kinds of refrigerators, and probably he might be able to dispose of some.

THOMAS BROWNE,
Consul.

UNITED STATES CONSULATE,
Paramaribo, January 22, 1890.

ECUADOR.

REPORT BY CONSUL-GENERAL SORSBY, OF GUAYAQUIL.

The total number of refrigerators in use in this district is about fifty, all of which are in use by private families. There are two large ones in use—one by the Lager Beer Association and the other by a saloon.

There are no special features required.

Those in use are of American patent and make. The sizes are 4 by 2½ by 2½ feet. Price here, $35 gold, two and three compartments, Jewett's Queen.

The Lager Beer Association manufactures the ice with an American machine, the La Vergen. The price of the ice is, wholesale, $2 gold per 100 pounds and 7 cents gold retail.

Food and liquids are not preserved, everything of that nature, when used at all, being imported. R. B. Jones & Co. would be the best parties to whom circulars, etc., should be sent.

WILLIAM B. SORSBY,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Guayaquil, January 20, 1890.

COLOMBIA.

BARRANQUILLA.

REPORT BY VICE-CONSUL WHELPLEY.

The Colombian housekeeper has a prejudice against keeping fresh meat uncooked; it must be cooked the day of killing; fish or fowl the same—a natural and necessary usage in a climate where the mercury stands at 84° to 86°, and the air teems with insect life to such an extent that two hours' exposure is often sufficient for the deposit of larvæ.

Given such atmospheric conditions, and the natural effect on animal food, when ice was an unattainable luxury, as it was a few years ago, and we must consider such a prejudice on the part of the housekeeper as reasonable.

Cooked food of any description left over from the meals of the family is considered the rightful perquisite of the servant, who may have several persons dependent upon her and with whom she shares the gleanings from the master's table. Consequently no cooked food is kept over from one meal to another; no perishable viands are preserved from one day to the next. This custom, hereditary from the days of Spanish rule, and the patriarchal simplicity of the early settlers with their large retinues of household slaves and poor dependents, is another reason why refrigerators are not considered a necessity.

The kitchens are generally in detached buildings or isolated inclosures, apart from the residences. The swarms of ants and other predatory insects, attracted by the odor of food, renders it necessary, and is another reason why its immediate consumption is preferable to its temporary preservation.

From my own household experience I believe that in a country so infested with insect pests the feet of any closet, safe, or refrigerator should be set in metal cups, the cups to be filled with water when necessary, or salt and kerosene, to prevent the entrance of vermin.

There are but two refrigerators, I believe, in actual use, and these were made in New York. But as the supply of artificial ice has heretofore been very uncertain, owing to defects in machinery or mismanagement, these can hardly be said to be in use.

The largest portable refrigerator, 5 feet by 5 feet by 5 feet (from Boston), was intended for a depository in an ice-cream establishment—a failure.

Steam-boats have their ice-boxes built in store-room or pantry.

The large earthen water jars, "Tinajas," keep the water sufficiently cool for drinking, generally 10° or 12° below the temperature of the air, and in the minds of many ice is a luxury of doubtful merit in a sanitary point of view. The limited consumption, from 500 to 700 pounds daily, may be increased hereafter, as there is a new apparatus being put up at the present time, promising a better quality and at cheaper rates. Ice is now from 5 to 7½ cents a pound. So far the drinking saloons, club-rooms, hotels, and steam-boats are the consumers, and as yet it is but rarely used in families. Economy in household expenses also has due weight among a people more accustomed to plain but substantial fare rather than luxurious living.

The duty on a refrigerator would be 20 cents a kilogram, with 25 per cent. additional. As to the best manner of introduction, perhaps circulars sent to the consulate for distribution would be the best preliminary step, if accompanied by illustrations and price-lists in Spanish. The

progress of new ideas, in conflict with hereditary domestic customs, must necessarily be slow, but the ultimate victory will be on the side of the greatest economy.

S. M. WHELPLEY,
Vice-Consul.

UNITED STATES CONSULATE,
Barranquilla, January 24, 1890.

COLON.

REPORT BY CONSUL VIFQUAIN.

Refrigerators are not in use in this consular district.

For this district they should be so constructed as to be saving of the ice.

I have found three refrigerators. One at the Pacific Mail Office, the Allegretti patent; it is used to keep cigars, hence not a success as refrigerator. I have found two at a store for sale, where they are liable to remain. They belong to the Jewett Manufactory, and they are both different. One is called the Queen; it sells for $40 Colombian currency, or $25 gold. The other is the Labrador; it sells for $35 Colombian currency, or $22 gold. There is no demand for them because they require too much ice. These refrigerators are manufactured in New York.

Ice is imported from the United States; principally from the Kennebec River. The ice traffic is in the hands of a monopoly; this monopoly is, by its contract with the Government, obliged to sell ice at 5 cents per pound.

This is in answer to the questions, and I submit the following for the information of the manufacturers of refrigerators.

If there is any country in the world where refrigerators are needed, this must be the country. But such a refrigerator is needed as will have a due regard for the saving of the ice, as this article is very dear.

The means resorted to here to preserve foods and liquids are ice-boxes of the "Ideal" model, manufactured in New York, from No. 2 upwards; they sell for from $10 to $20, Colombian currency, or from $6.50 to $13, American gold. They are a very unhandy affair, but answer the purpose better than refrigerators, simply because the latter use too much ice. A medium-sized refrigerator, saving of the ice, would be of great service to the people here, and would prove of good sale, provided the qualities of the same had been fairly tested. The best method for the manufacturers of good refrigerators to introduce them here is to send an active agent, with the knowledge of the Spanish language, on the spot; if this be considered too expensive, let them select a good house here.

VICTOR VIFQUAIN,
Consul.

UNITED STATES CONSULATE,
Colon, January 8, 1890.

PANAMA.

REPORT BY CONSUL-GENERAL ADAMSON.

Refrigerators are used in this consular district to a very limited extent. Dealers decline stating the number sold in a year, but I believe one dozen would more than supply the annual demand of this market.

There are no peculiar features required in the construction of those for this district. Those in use in this district are manufactured in the United States, probably New York.

The only ones I have seen are marked "Mace's diamond refrigerator." They are of four sizes, averaging about 3 feet in height, 30 inches wide, and 18 inches deep, containing in the upper half a zinc ice-box of about 24 by 15 by 15 inches, underneath which is the place for the food to be preserved; average price, $14 gold.

All the ice used here is brought from the State of Maine. The business is a monopoly. The Government stipulates with the monopolists that ice must be sold at not more than 5 cents, Colombian coin, per pound.

It is not customary in any of the countries of Spanish America to take the pains to preserve food such as is taken by our American housekeepers.

The people seem to provide only for their immediate wants, and ice is so expensive that there would not be much economy in saving food by the use of ice and refrigerators.

I do not know of any way by which the demand for refrigerators in this district can be increased to any great extent as long as the sale of ce continues to be a monopoly.

THOMAS ADAMSON,
Consul-General.

UNITED STATES CONSULATE GENERAL,
Panama, January 27, 1890.

VENEZUELA.

REPORT BY CONSUL BIRD, OF LA GUAYRA.

Refrigerators are used to a very limited extent in Venezuela.

There are no peculiar features required in their construction, except that they should be made of walnut, to withstand the ravages of the wood maggot, so destructive to ordinary American woods.

Those in use here are imported from the United States.

The usual sizes and forms made in the United States are found to be suitable here. The prices are more than 100 per cent. greater than in the United States, owing to the fact that, duties being assessed on the gross weight, refrigerators pay heavy duty. For instance, one weighing 300 pounds, made of walnut, would pay $33.29 duty and $4.16 transit

tax. If made of ordinary wood it would pay $19.98 duty and $2.50 transit tax. By ordinary wood is meant maple, pine, oak, etc.

Ice is manufactured in Caracas, and is sold at $4 per 100 pounds. None is imported. It is believed that if a proper ice depot were established in La Guayra and importations of natural ice introduced from the United States a profitable trade might be eventually built up. By the tariff it is admitted free of duty. While ice is so dear here, the use of refrigerators will be necessarily very limited.

WINFIELD S. BIRD,
Consul.

UNITED STATES CONSULATE,
La Guayra, January 11, 1890.

BRITISH WEST INDIES.

BERMUDA.

REPORT BY CONSUL BECKWITH, OF HAMILTON.

Refrigerators are used here extensively in hotels, saloons, and private houses.

There are no peculiar features required in their construction.

All used here are manufactured in the United States.

Those used here are of the same formations, sizes, and prices as those used in the States.

Ice is imported here from Maine in American vessels. Price per 100 pounds, 75 cents.

HENRY W. BECKWITH,
Consul.

UNITED STATES CONSULATE,
Hamilton, January 1, 1890.

JAMAICA.

REPORT BY CONSUL ALLEN, OF KINGSTON.

Refrigerators are in general use in this consular district and throughout the island of Jamaica.

They are of ordinary construction, such as are in general use in the United States.

Those in use in this district are manufactured in the United States.

Sizes 4 by 2 by 3 feet and upwards, as in the United States.

The price of ice is 75 cents for 100 pounds. All ice consumed in this district is manufactured by one company from machines of American pattern, and the management of the factory is under the direction of an American expert.

The steamers plying between the United States and outports of this island bring small quantities of ice occasionally, but the quantity being thus brought is limited and in no way affects the price of the article, thus this entire consular district is virtually dependent on Kingston for its supply.

W. G. ALLEN,
Consul.

UNITED STATES CONSULATE,
Kingston, February 3, 1890.

LEEWARD ISLANDS.

REPORT BY CONSUL JACKSON, OF ANTIGUA.

Little trade can be expected in this quarter owing to the hand-to-mouth method of living, the high price of ice, and the general poverty that prevails among the bulk of the population. Although Maine ice is in good supply, and we a population of 35,000, generally very thirsty, the consumption of ice rarely exceeds 300 pounds a day.

The retail price is $2 per hundred, but if it were furnished at half the price I doubt if the consumption would show much improvement.

A few refrigerators of American make were imported by the party having the ice contract here, and have been sold cheap to encourage the use of ice. They give good satisfaction.

In the Dominica consular agency district ice is kept in supply and retailed at 3 cents per pound; but the circumstances surrounding that place are much more aggravated than obtain in Antigua, consequently a very limited demand must exist for refrigerators.

The consular agency districts of Anguilla, Montserrat, Nevis, and Portsmouth are without ice, and a few pounds only would be consumed however cheap it could be supplied.

CHESTER E. JACKSON,
Consul.

UNITED STATES CONSULATE,
Antigua, February 28, 1890.

NASSAU.

REPORT BY CONSUL M'LAIN.

There are very few refrigerators in use in this colony, there being no supply of ice outside of this city and the high price of the article forbidding its general use in Nassau. I do not suppose there are fifty refrigerators, including all kinds, good, bad, and indifferent, in use in the entire Bahamas. They are never kept in stock by the merchants, and dealers inform me that the demand for them is so small as not to be worth mentioning. Now and then some person needs one and the merchant orders it for him.

Any ordinary refrigerator will meet all the requirements of the people of this colony.

The few in use are of American manufacture.

They are small ones, such as retail at from $8 to $12 in the United States, and are of all conceivable forms and patterns. A few, known as the "Eddy" and the "Arctic," have been imported within a year or two.

The supply of ice comes from Maine, imported in schooners. No attempt has ever been made to manufacture ice here, those interested

having figured out that it would not pay to do so. The use of ice is confined to comparatively few families, and probably the quantity sold per annum will not exceed 400 to 500 tons. The price varies, ranging from 2 cents to 4 cents per pound. A large ice-house is owned by the Government, which is rented to parties who give bonds to keep a supply of ice always on hand, to be sold at not to exceed 4 cents per pound. The hotel here has its own ice-house and imports 200 tons per annum.

Families who desire to preserve meats or poultry for a few days send it to the "ice-house," where it is kept for a small consideration. Beef, mutton, etc., are used the same day as killed as a rule; poultry killed when needed; fish sold alive every day in the market.

I do not see any way of introducing refrigerators into this colony at present more extensively than they are coming in at this time. It is only now and then that one is needed, and it is at once ordered by some merchant from New York.

Ice is too dear, the people are too poor, the need of refrigerators is not felt enough to warrant any expectations that a trade worth having can be developed in this article in the Bahamas. The only consolation is that whenever any are purchased they are bought in the United States.

THOS. J. MCLAIN, JR,
Consul.

UNITED STATES CONSULATE,
Nassau, N. P., January 8, 1890.

TOBAGO.

REPORT BY CONSULAR AGENT KEENS.

Refrigerators are not at all used on this island.

Ice is seldom imported, occasionally a few hundred pounds are procured from Trinidad or Barbadoes for special occasions, when its cost is very high, but it is not generally used by the inhabitants.

I have no doubt that if this article could be procured at a low rate and in small quantities to meet the consumption of the island greater advantage would be taken of it, and refrigerators or machines for making ice on a small scale might be the means of establishing its use.

I think that it would be well if I were furnished with catalogues and price-lists of several makes so as to see what could be done in establishing such a system.

EDWARD KEENS,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Tobago, February 14, 1890.

TRINIDAD.

REPORT OF CONSUL SAWYER.

Refrigerators are in use in this district and to a large extent.

There are no peculiar features required in their construction other than the usual ones manufactured in the United States—chest and upright ones.

Those in use are manufactured in the United States, chiefly in Boston.

The sizes are various; small, medium, and large, chest and upright principally. Prices vary from $6 to $24 each.

Ice is imported into this island from the United States, principally from Boston. The price is generally $1 per 100 pounds excepting in times of scarcity.

MOSES H. SAWYER,
Consul.

UNITED STATES CONSULATE,
Trinidad, January 29, 1890.

FRENCH WEST INDIES.

GUADELOUPE.

REPORT BY CONSUL BARTLETT.

Refrigerators are not used in this consular district. I know of but one in Guadeloupe, and that I have myself at my little country place, and it is of the old style I purchased about fifteen years ago.

There being none used, this replies to interrogatories 2, 3, and 4.

There are two ice establishments, situated at Pointe-à-Pitre; one a French company, manufacturing artificial ice sold at their establishment, which manufactures only the quantity required daily; the other, part owned here and a portion in the United States, is called the "American Ice Company," which imports ice from Maine, which is secured in an ice-house built on the same principle as those in the State of Maine.

There is also an ice retailing establishment at Basse-Terre, to which the Government grants a subsidy of 2,000 francs per annum. There is a similar one at the Moule, which receives an annual subsidy of 1,200 francs from the town; another one, established at St. François, receives 600 francs subsidy per annum. There was one at Capesterre receiving an annual subsidy of 1,500 francs, but this subsidy having been withdrawn in January this year the establishment was subsequently closed.

The ice establishments at Pointe-à-Pitre do not receive any subsidy.

Ice purchased in town for the country is generally wrapped up in coarse woolen blankets.

The retail price of natural ice at Pointe-à-Pitre, for the present, is 25 centimes per kilogram, and at wholesale 150 francs per ton of 1,000 kilograms.

Artificial ice is retailed for 20 centimes (4.8 cents) a kilogram (2.205 pounds), and at wholesale 120 francs per ton of 1,000 kilograms.

Both natural and artificial ice are sold at retail in Basse-Terre for 30 centimes (5.8 cents) a kilogram.

At the Moule, St. François, and Capesterre it is retailed at 40 centimes a kilogram.

There is no ice sent round in carts, as customary with us. The families purchase their food in the morning sufficient for the daily supply. Bread is obtained fresh every day from the bakeries.

The butchers slaughter just sufficient for their daily sales, and should any quantity of beef happen to be left on hand, it is sent to the ice-house to be put in the ice-chest.

It seems to me that refrigerators ought to be used; and if the manufacturers of refrigerators were to address catalogues of their different

kinds of refrigerators to the ice companies here, I have no doubt but that some of the families in Guadeloupe might be prevailed upon to make use of them.

CHARLES BARTLETT,
Consul.

UNITED STATES CONSULATE,
Guadeloupe, February 18, 1890.

MARTINIQUE.

REPORT BY CONSUL GARESCHÉ.

Refrigerators are used in this island to a very limited extent, principally by hotels and a few large boarding-houses.

Save one imported last year from Burlington, Vt., I know of none that are not of the primitive manufacture of this island.

From the above observations it can be inferred that not only are the refrigerators here used manufactured in this island, but that it would be impossible to give even an adequate idea of the sizes, formations, and prices thereof in this district.

Ice is almost entirely the product of machinery here, save, perhaps, an occasional cargo sent to Fort de France from the United States mainly for the use of the steamers of the Compagnie Generale Transatlantique.

Without distinction between the natural and artificial product, ice retails here the year round at 3 cents per pound, very little, if any, deduction being made for purchases in large quantities.

In conclusion I would say that refrigerators of moderate size might be profitably introduced here. At all events, since the modern article is almost entirely unknown, the venture might be worth the risk.

In my estimation, the best manner of introducing refrigerators would be to send a sample to each of the leading clubs here—there are two—and one to the leading hotel in Fort-de-France, and also to the only hotel in this city of St. Pierre. In this way their benefits could be appreciated, and the enterprising manufacturer who is willing to risk this much would profit by the education of this people.

Perhaps this would be ultimately cheaper than sending a commercial traveler here.

If any manufacturer desires to send one first-class specimen, of moderate price, I will gladly take charge of it and place it in such public location as may best serve to advertise the article.

WM. A. GARESCHÉ,
Consul.

UNITED STATES CONSULATE,
Martinique, March 12, 1890.

HAYTI.

REPORT BY MINISTER DOUGLAS, OF PORT AU PRINCE.

The refrigerators are not at all in general use here; they are, in fact, very rarely found either in families or in places of popular resort. The people here have never been accustomed to them, and do not feel the need or in general know the value or use of them.

Ice is brought here in vessels from the United States, usually from Maine. The price of it is $5 per 100 pounds. The articles exported from this country to the United States are of such a nature as to appear not to require samples of them to be transmitted to the collectors of customs of the ports of their destination, as contemplated in the circular of November 27, 1889.

FREDERICK DOUGLAS,
Minister.

UNITED STATES LEGATION,
Port au Prince, January 16, 1890.

SAN DOMINGO.

PUERTO PLATA.

In answer to refrigerator circular of November 25, 1889, I have to report that no refrigerators are used in this district, nor is ice obtainable for any purpose.

THOMAS SIMPSON.

UNITED STATES CONSULATE,
Puerto Plata, February 27, 1890.

SPANISH WEST INDIES.

CUBA.

HAVANA.

REPORT BY CONSUL-GENERAL WILLIAMS.

With the view of obtaining reliable information upon the subject, I addressed a note on the 26th of last month to Mr. F. K. Sowers, a citizen of the United States established here, he being thoroughly informed both with respect to the importation of refrigerators and the manufacture of ice in this city. Accordingly, I inclose for the information of the Department a copy of the answer of Mr. Sowers, dated the 27th of December ultimo.

RAMON O. WILLIAMS,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Havana, January 13, 1890.

Mr. Sowers to Consul-General Williams.

In reply to your esteemed favor of yesterday with copy of circular from the Department of State asking for information regarding the use of refrigerators and how ice is obtained in this city, I take pleasure in answering the five questions therein contained, to the best of my ability, thus:

Refrigerators are used in this city, but to no great extent.

There are no peculiar features required in their construction for use in this place; still I will say that some people prefer those prepared with separate compartments for water, as many like cold water, but do not want ice put in it.

Most of the refrigerators used are imported from the United States, some few from France, and still a smaller number made here.

Different sizes are used, say for families, 24 inches front by 36 inches height up to 40 inches front by 50 inches height, up to 75 inches front by 65 inches height; the class known as "upright" are generally preferred to the "chest." Prices from $20 to $150, according to size, class, material used, and fancy work.

Ice is manufactured here, and price at present from 60 to 80 cents per 100 pounds, according to quantity and location of delivery.

I would also add that I am inclined to think the use of refrigerators would become more general if they could be delivered here cheaper. The high freight and duties increase the cost beyond the means of many people. Possibly it might be an object to large manufacturers in our country to ship them in the "shook" form and then erect or put them together here; but in this case it would be necessary to send down an experienced man to do the work.

F. K. SOWERS.

Havana, December 27, 1889.

MATANZAS.

REPORT BY CONSUL PIERCE.

Refrigerators are used in my consular district to the extent of about fifty per year.

There are no peculiar features in their construction and all are manufactured in the United States. The prices vary from $10 to $70, according to sizes and formations, which also differ to suit the wants of the purchasers. The ice used in this consular district is supplied from Havana, and the price is $6, Spanish gold, per 100 pounds.

The best manner of introducing refrigerators is through commission houses.

FRANK H. PIERCE,
Consul.

UNITED STATES CONSULATE,
Matanzas, January 14, 1890.

SAGUA LA GRANDE.

REPORT BY COMMERCIAL AGENT MULLEN.

Refrigerators are almost unknown in this district, there being but one in use here.

The ordinary American refrigerator would fill all the requirements necessary.

Ice is secured in home-made chests consisting of two ordinary boxes, the inner one lined with zinc and the intermediate space between both boxes packed with ordinary salt. There are two deposits of this kind in this district, each one capable of storing about five tons of ice. This ice, which is artificial, is purchased at $16 per ton and sold here at $3 per hundred-weight.

At a first glance it would seem that a refrigerator of some kind would be an absolute necessity in this climate; but when it is understood that the meat intended for daily use is slaughtered every day, it will be apparent that the necessity is not so urgent. Meat killed at 2 p. m. is in some instances placed on the table for use at 6 p. m., and, as a general rule, is tough and unpalatable. During the warm summer months meat becomes tainted inside of twenty-four hours. At the hotels and restaurants meats are kept in an ordinary ice-chest and in direct contact with the ice. Have consulted various persons regarding their opinion, and the general verdict is that the refrigerators are too large and costly. I would therefore suggest for the use of this district a plain, medium-sized refrigerator, the cheapness of which will recommend it to the public in general. The best manner of introducing this and all other manufactures would be through an agent who thoroughly understands the business, and who has a good knowledge of the Spanish

language. The sending of agents to this country who do not understand the language is a failure, as all their business must be done through an interpreter who is not well informed on the subject and fails to convey the ideas of the agent. In cases where it is impossible to send a special agent, would recommend the appointing of a resident in the various towns and cities. Printed circulars in English is money thrown away.

D. M. MULLEN,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Sagua la Grande, January 22, 1890.

SANTIAGO DE CUBA.

REPORT BY CONSUL REIMER.

The fact that on an average only 3 tons of ice per day are consumed in the city of Santiago de Cuba, boasting of a population of nearly 48,000 souls, is conclusive proof that the resources of the people do not permit a large consumption of ice. The exorbitant prices charged by the local company manufacturing artificial ice—$2.50 Spanish gold per 100 pounds wholesale, and $5 Spanish gold per 100 pounds retail—is no doubt, to a great extent, to blame for this, but not altogether. It seems that the colored element, which composes two-thirds of the population, consumes no ice at all, and this, in many instances, because they are not used to it, and I am convinced that even were ice cheaper they would not use it. Almost all the ice consumed here is used by Spaniards and foreigners. The twenty-two to thirty head of cattle killed daily to supply meat to the city are consumed the day following, and are brought from the slaughter-houses direct to the market. Poultry is all sold alive, and killed just before preparing for the table.

The only refrigerator in use here is an old one of American manufacture at the restaurant "La Venus," the largest restaurant here. At the high prices of ice private families use no ice-boxes, but buy their supply to cool beverages daily before meals, and in pieces of 1 to 5 pounds.

It is my opinion that before refrigerators can be introduced here the price of ice must be reduced. I have been requested by people whom I have interviewed in reference to the circular to procure for them circulars of large ice-machines and small ones for family use. As soon as competition can put the price of ice on a basis so that the public can be large consumers, I believe there is a field for the sale of refrigerators of American manufacture.

OTTO E. REIMER,
Consul.

SANTIAGO DE CUBA, *January* 10, 1890.

CONTINENT OF ASIA.

BRITISH ASIA.

BOMBAY.

REPORT BY VICE-CONSUL BODE.

Refrigerators have very little demand in my consular district. It is very difficult to sell, say, thirty or thirty-five of them in a year. They are only used in some hotels and clubs and not in every family, because they have not adopted the system of preserving food and liquids. When people want to preserve ice in summer they have large wooden boxes lined with zinc or tin-plate, which only cost them 10 rupees (1 rupee equals 32.2 cents), while the English-made refrigerators are sold from 50 to 100 rupees.

There are factories established in Bombay since 1872 and up-country for the manufacture of ice, which is remarkably cheap. Price for 100 pounds is only 3 rupees, equivalent to $1.

H. E. BODE,
Vice-Consul.

UNITED STATES CONSULATE,
Bombay, February 28, 1890.

CALCUTTA.

REPORT BY CONSUL-GENERAL BONHAM.

Refrigerators are quite extensively used in this consular district by hotel and boarding-house keepers, as well as by many private families.

The only peculiarity or requisite in the construction of refrigerators for use in this climate is, that they should be made of lumber that is the least susceptible to shrinkage during the dry season and to expansion or swelling during the rains, and which is not subject to ravages by the white ant. The form of construction is substantially the same as of those in common use in the United States. In fact, I was told by a member of a large and reliable firm in Calcutta (Messrs. T. E. Thompson & Co.), who, amongst other things, manufacture refrigerators for the Calcutta and surrounding markets, that some years ago they procured some refrigerators from the United States which were satisfactory in the form of construction but which were defective in the quality of the lumber on account of its susceptibility to shrink and swell. During the dry hot weather (my informant stated) the joints

would open so as to let in the hot air, and during the wet weather the wood expanded so that the doors could not readily be opened or shut. Said firm then ordered another consignment of refrigerators from the United States made of hard wood, and these worked better, but were not entirely satisfactory in the respects above named.

Messrs. Thompson & Co. then turned their attention to the manufacture of refrigerators from Indian teak-wood, which is used very extensively in this country in the manufacture of furniture and for various other purposes, and is said to be less liable to shrink and swell than any other wood that is generally obtainable in this country. It should also be understood that the white ant of India, which bores into honeycombs, and destroys most kinds of soft woods, very seldom disturbs teak-wood.

The refrigerators in use in this district are manufactured in this country. The labor of a native carpenter (without board or lodging) is from 12 to 15 rupees per month ($4 to $5), and that of a good native cabinet workman about double that of the carpenter. Of course the native mechanic works by hand and his tools and other mechanical appliances are of very simple construction. But, considering the great disparity in the price of mechanical labor between this country and the United States and the superiority of the Indian teak-wood for climatic and other reasons stated, I am afraid that the outlook for building up a trade in refrigerators in this country is not very encouraging. I also find that the few American carriages which have been brought to Calcutta do not stand the climate here so well as those manufactured in the country of teak and other hard Indian woods.

From Messrs. T. E. Thompson & Co. (above referred to), I learn that the common sizes manufactured by them are as follows: 36 by 26 by 21 inches on stand and 30 by 22 by 19 inches on stand. They retail the larger size at 110 rupees (about $36.33) and the smaller at 100 rupees (about $33.33).

The refrigerator above referred to has a zinc ice-box in the top, with with a small lead pipe leading from it to the lower part of the main box, which is also provided with a zinc basin in which wines, etc., may be placed for cooling, and upon which the ice-water trickles through the small pipe referred to. The intervening space between the ice-box and wine-basin is provided with the ordinary gridiron shelves (usually one or two) as receptacles of such articles of the cuisine as it is desired to keep cool.

All the ice we have here (nearer than Kunchinginga) is manufactured and sells at about $1 per 100 pounds.

Prior to the discovery of the art of manufacturing ice, I believe the principal supply of that luxury was shipped here from the United States.

B. F. BONHAM,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Calcutta, February 4, 1890.

STRAITS SETTLEMENTS.

REPORT BY VICE-CONSUL LYALL, OF SINGAPORE.

Refrigerators are not used in this country to any great extent. Most private residences of the better class have an ice-box of some kind, but ice is cheap and generally is kept by the servants in a gunny bag, blanket, or wooden box with saw-dust, washed at meal-times and put into the drinking-glass. Meat in this country must be cooked within twenty-four hours, all the year round, after being killed, so that refrigerators on a large scale, if kept by butchers, would be most useful and one would suppose very profitable, but there is nothing of the kind here.

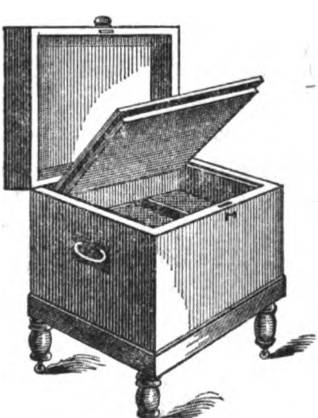
The sketch attached to query No. 4 gives an idea of the refrigerators used here.

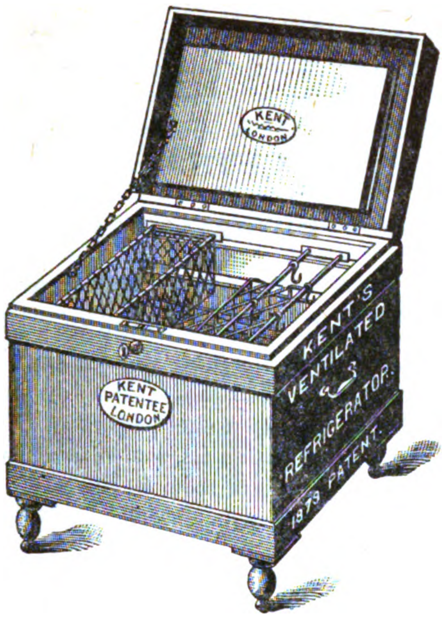
The refrigerators in use in this district come chiefly from England and Germany, occasionally from the United States, and are also made on the spot.

A German mercantile firm, who say they receive consignments of refrigerators from Germany in invoices of half a dozen at a time, give the following prices (wholesale), viz: 30 by 24 by 24 inches, $20 each; 42 by 24 by 24 inches, $30 each.

A retail shopkeeper (the principal shop in the place) reports as follows: 25 inches square, $15; 28 inches square, $18; 31 inches square, $24. Kent's refrigerator, 22 by 20 inches, $40.

The sketches attached hereto show the Kent boxes.





Ice is made daily to meet the current demand, and is taken from the manufactory, as required, by the servants of consumers. The retail price is one cent per pound. For large quantities some abatement would be made.

An efficient and well kept refrigerator every one acknowledges in tropical countries to be a great boon, and if asked why in that case they are not more in use in this district, I think the reason is mainly that the native servants do not properly understand them or will not take the trouble to handle them; and perhaps also it may be due in some degree to the inefficiency of the refrigerators in use.

A refrigerator which will keep its contents really cool with little trouble should become popular in this place.

The best mode of introducing American refrigerators into this district would be the usual one of a trial consignment, with full information as to the mode of handling them. It must be kept in mind that the European community, who are the only users of refrigerators, is comparatively small, and a trial consignment of half a dozen boxes would be ample.

J. Lyall,
Vice-Consul.

United States Consulate,
Singapore, *March* 4, 1890.

CHINA.

CHINKIANG.

REPORT BY CONSUL JONES.

The refrigerators in use in this district are very few and are simple ice boxes or chests about 2½ feet square in area at the top and 3½ or 4 feet high. They have two compartments, the top one for the ice and the one below, divided by an open shelf, for meats, butter, etc. They are made of pine wood, lined with zinc, and filled in with charcoal, are of American manufacture, and cost from $12 to $15. They answer the purpose for small families, but are entirely inadequate for anything beyond this.

The winters in this climate are never very severe. The ice is secured from ponds of water, some of them made for the purpose, and is rarely over an inch in thickness. It is stored in ice houses constructed very like the old fashioned ice houses in the United States, by digging a chamber in the earth, lining the sides and floor with planking, and covering with a straw roof.

The water in the ponds can not be said to be of the purest, as it is used by all the families in the neighborhood, who wash their clothes in it, and is also the resort of all their ducks, geese, and buffalo. The ice, therefore, can never be used by mixing it with liquids. Bottles of water, etc., for table use, are kept cool by burying them in it.

The cost of ice in the summer is about 60 cents per picul (133⅓ pounds). The Chinese do not use it and seldom drink water. The common beverage is tea, which is drank hot and without milk or sugar. This tea is a weak infusion of the common leaf, the cheapest possible commodity, and is accessible to all.

As ice is expensive and often difficult to secure, moderately cheap and easily managed machines for the manufacture of ice would find a ready market in this country. At several of the ports of Japan ice-machines are in use, but they are, I believe, of English manufacture, and too expensive for small communities or family use.

The best method of introducing modern American refrigerators into this district would be for a manufacturer to send one as a sample, that the people may see and understand its use.

A. C. JONES,
Consul.

UNITED STATES CONSULATE,
Chinkiang, March 18, 1890.

HONG-KONG.

REPORT BY CONSUL SIMONS.

Refrigerators are in use in every house, with the exception of those occupied by Chinese, in all hotels, restaurants, clubs, stores, and on steam-ships. The temperature rarely falling below 60° Fahrenheit during the winter months and for the other eight months of the year rarely below 80° Fahrenheit, with the maximum of moisture in the atmosphere, which, quite as much as the long continued high temperature, facilitates decomposition and fermentation, refrigerators become a necessary appliance toward securing the ordinary comforts of life.

No peculiar features of construction are required in addition to securing the greatest cold with a given quantity of ice for the longest time, a purpose arrived at doubtless in the construction of refrigerators for use in any country.

With scarcely an exception, those in use are manufactured by Chinese cabinet-makers after the patterns of those brought to the colony by Europeans many years ago.

These people imitating everything, while practically originating nothing, makes it extremely likely that, should refrigerators of an improved American pattern be brought to this market in such numbers as to enter into competition with them, they would soon begin the manufacture of them at prices so low that competition would be impossible, the wages paid for such work not exceeding 30 cents a day. Sizes range from 3 feet, costing from $8 to $20 Mexican. Those used on board coasting steamers are much larger, costing in proportion. They are made in wardrobe shape, not unlike those in use in the United States; the outside of wood, 1 inch in thickness, lined with zinc or tin, with a box for the reception of ice at the top. None that I have seen are filled with non-conducting materials or substances.

Ice is manufactured by the usual ammonia and damp-air machines and sold at $1.50 per hundred pounds. I inclose the annual report of the ice company, which indicates a prosperous condition of their affairs.

As to the best manner of introducing refrigerators of American make, which are no doubt greatly superior to those now in use here, a difficulty presents itself already stated, the certainty of their being imitated by Chinese workmen; another, the absence of any tradesman engaged in in selling goods of American manufacture; so that there is no one to whom a consignment could be made with a reasonable hope that merit alone would be sufficient to create a demand. Considering the number of places on this coast where refrigerators are used it is likely the sending of an agent capable of setting forth the advantages of the thing he sells, after the manner of the commercial traveler, while at the outset attended with considerable expense, would, in the end, secure the most substantial results.

O. H. SIMONS,
Consul.

UNITED STATES CONSULATE,
Hong-Kong, February 11, 1890.

[Inclosure in Consul Simons's report.]

THE HONG-KONG ICE COMPANY, LIMITED.

The following is the ninth annual report:

The general managers beg to submit to the share-holders a statement of the company's accounts for the year 1889:

The business of the company has continued to improve, and the result of the year's operations, inclusive of balance from last account, is a profit of $37,896.78.

On the 2d August last an interim dividend of 7 per cent. was paid, which absorbed a sum of $8,750, and there is now a balance to be dealt with of $29,146.78. This will admit of the payment of a further dividend for the year of 17 per cent., or $4.25 per share (making 24 per cent. in all) $21,250.00, and an addition to reserve and depreciation fund of 7,500.00, leaving to be carried forward to new account 396.78; total 29,146.78.

In order to meet the increased demand upon the company it has been found necessary to substitute for the old dry-air machine, which is now obsolete, a modern one, and the order has been placed in the hands of Mr. Bain, the late manager. The cost of the new machine, together with the extension of the present buildings, it is estimated will amount to about $25,000.

The ammonia and damp-air machines were continuously at work day and night during the summer months.

The accounts have been audited by Mr. Thomas Arnold, and the general managers recommend that he should be re-elected auditor.

JARDINE, MATHESON & CO.,
General Managers.

HONG-KONG, *February* 3, 1890.

ASSETS.

Property account	$161,368.05
Invested in Hong-Kong Fire Insurance Company's share	345.00
Cash on hand	281.73
Hong-Kong and Shanghai Bank, current account	27,676.88
Hongkong and Shanghai Bank, deposit account	9,000.00
Outstanding accounts	1,715.83
Accounts receivable	393.29
Ice on hand	180.00
Stores on hand	84.00
Extension account	2,464.26
	203,509.09

SHANGHAI.

REPORT BY CONSUL-GENERAL LEONARD.

There are about eight hundred foreign houses in Shanghai, and it is doubtful if there is one wherein a refrigerator or ice-box is not in use seven or eight months of the year.

There are no peculiar features required in the construction of refrigerators for this district, except that the ice-chamber should be larger than usual, to hold the ice as frozen and gathered as described in No. 5.

The refrigerators in use in this district are manufactured here with the exception of a few imported from the United States.

The common-sized ice-box ranges to meet the wants of the family. Ice-chambers are on top or side, and the cool chamber adjoining. Price from $15 to $50.

Ice is gathered from rice fields flooded with dirty water pumped from stagnant ditches and ponds, the temperature at which it is frozen is seldom lower than four or five degrees below the freezing-point. It is stored in houses built on the level ground, having mud walls 10 or 12 feet high and covered with straw or tiled roofs. The ice frozen at such a high temperature melts very rapidly, so that refrigerators have ice-chambers larger than usual.

In addition to the natural ice, there is a small ice-machine, but its limited power and the cheapness at which the natural ice can be purchased from the native dealer leaves but little room for its business.

The average price of the natural ice is 50 cents per 100 pounds.

J. A. LEONARD,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Shanghai, February 24, 1890.

TIENTSIN.

REPORT BY CONSUL BOWMAN.

Refrigerators in this consular district have a very limited use among the American and European residents and among a few of the wealthier Chinese families.

No peculiar features are required in their construction as far as I know.

Those in use here are made by individual carpenters.

The kind used among the Chinese are simply tin-lined boxes, with holes below for draining off the water. There are no regular sizes or prices.

The kind used by the foreign residents are also manufactured on the spot by Chinese carpenters, and vary in size and price according to the caprice of the person ordering.

Ice is obtained from rivers and ponds, and is usually sold at about 25 cents per 100 pounds.

I regret that owing to the nature of the case my replies to the questions asked have been rather indefinite.

WILLIAM BOWMAN,
Consul.

UNITED STATES CONSULATE,
Tientsin, March 7, 1890.

JAPAN.

OSAKA AND HIOGO.

REPORT BY CONSUL SMITHERS.

Refrigerators are used in this district by foreigners, but not by the Japanese. The demand for them, therefore, is limited. The greater part of those in use are made in the country by the native mechanics and have no peculiar features in their construction. They are wooden boxes, made as far as possible air-tight and lined with zinc, with an open lattice-work partition, below which the ice is placed. These ice-boxes, as they are called, cost from $10 to $15.

Large quantities of ice are used by the Japanese as a beverage, but not to preserve meats or liquids. This ice comes from Hakodate and costs 1½ cents per pound. Large factories at Osaka and Hiogo are now manufacturing ice, which retails in small quantities at about the same price as the natural article.

E. J. SMITHERS,
Consul.

UNITED STATES CONSULATE,
Osaka and Hiogo, March 6, 1890.

NAGASAKI.

Refrigerators are only used in this district by private foreign families; and they have no features different from those in use in America, as to size, formation, or price.

Ice is secured in this district by importation from Tientsin, China, and within the last year a limited quantity has been manufactured by a Japanese company operating an ice-machine.

Price per 100 pounds, Tientsin ice, about $2.50; manufactured ice, $1.

JOHN M. BIRCH,
Consul.

UNITED STATES CONSULATE,
Nagasaki, June 18, 1890.

PHILIPPINE ISLANDS.

REPORT BY CONSUL WEBB, OF MANILA.

In a climate where the thermometer averages 90° the year round, an ice-box or cooling apparatus of some kind is considered a necessity by those who have the means to procure the comforts of life. Hence in Manila, Iloilo, and Cebu, the leading cities of the Philippine Archipelago, an ice-box may be found in the house of almost every foreign resident and in those of most of the well-to-do Mestizos. In Manila there are three ice-machines, one American (the De la Verne), one Swiss, and one German, which make about 18 tons of ice per day. Iloilo has one German machine and Cebu another. Families are supplied at 1 cent per pound and a single ton sells for $25;* special rates are made for larger quantities. The ice is produced in blocks weighing from 800 to 900 pounds and is then cut into oblong blocks weighing 10 and 25 pounds each for delivery to families. Twelve or fifteen carts are used for the purpose of delivery and there are as many more small depots in various parts of Manila where ice is retailed in quantities of 1 pound and upward. As a rule the ice is of excellent quality, being as clear as crystal, although occasionally a lot slightly clouded is turned out. Until about a year ago the product was usually like frozen snow and was always more or less clouded, but Señor Don E. M. Barretto, who has a monopoly of the ice business in Manila, has invented an improvement in the process of molding the blocks which clarifies them perfectly.

Owing to the prevailing system of supplying the family cook in the morning with the money necessary for each day's provisions there is little or no accumulation of food to be preserved from one day to another, and hence the ice is used principally for cooling drinks. The native method of preserving meats and fish is by drying or smoking them; the cooks buy these articles at the markets fresh every morning and, as the native rather prefers his meat a little tainted, the butchers usually get rid of all their stock in trade at a fair price. The native method of preserving meat and fish is to cut long gashes in it about an inch apart and hang it in the sun. Sometimes he salts it, and salt meats may be found in most of the markets.

The refrigerators are, as a rule, plain, double-walled, wooden boxes of various sizes, made by the Chinese cabinet-makers here and sold for from $10 to $18. The spaces between the walls are filled with sawdust, and the box inside is lined with zinc, with a half-inch hole in the bottom for an escape for the water. Midway between the top and bottom of the

*An evident error, but just as the consul wrote it. It should, perhaps, be a cent and a half per pound.

inner space and extending half way across it, is a zinc shelf, on which the ice rests, and the space around it is usually utilized for the storage of bottles of wine, beer, liquor, etc. The idea prevails generally that putting ice into the water is injurious to health, and the latter is therefore put into clean bottles, which are laid on the ice; but Señor Barretto tells me that since he has been producing clear ice there has been a largely increased amount of it put into beverages of all kinds. Should this practice become general, there would undoubtedly be a demand for the refrigerators with the zinc or iron water tanks in general use in the United States and the plain ice-boxes now in vogue would be discarded by those who could afford something better. But at present the latter fills all the requirements of domestic use and, as $15 and $18 are considered the highest prices that ought to be paid for such an article, when provisions and the other necessaries of life cost as much as they do here, it would, in my opinion, be difficult to find a profitable market here for the better class of American refrigerators.

The best manner of introducing American refrigerators would be to have an active, energetic salesman here who could speak the Spanish language. The next best method would be to induce one of the English, German, or Spanish houses to accept the agency for the manufacturers and make a special feature of American refrigerators. There are no American dealers here, and extra inducements would probably be necessary to stimulate interest in the making of sales. Indifference and even opposition would be met with at first, but perseverance and tact would undoubtedly secure satisfactory results.

The duty on refrigerators is 10 per cent. of the declared value, 20 per cent. on the duty for port tax, and $1 per ton.

ALEX. R. WEBB,
Consul.

UNITED STATES CONSULATE,
Manila, January 24, 1890.

SIAM.

REPORT BY CONSUL-GENERAL CHILD, OF BANGKOK.

Only a small number of refrigerators are used here.

There are no peculiar features required in their construction, except that they are almost exclusively used to cool bottled aerated waters and liquors.

They are of local Chinese make.

They are generally box-shaped, lined with zinc, and vary in price according to size and contract with the maker.

Artificial ice at $2.50 per 100 pounds.

JACOB T. CHILD,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Bangkok, February 26, 1890.

TURKEY IN ASIA.

ASIA MINOR.

REPORT BY CONSUL EMMETT, OF SMYRNA.

The use of refrigerators is so limited as to warrant me in saying as a household convenience they are unknown. Less than a dozen are in use in this city, and those are in beer saloons.

I should judge that a good cheap article would be the only one to find sale; and owing to the extreme carelessness of servants one fed from top with ice compartment separate from food closets would be most likely to find favor and do good service.

The refrigerators in use in this district are manufactured in Germany. The sizes are large, for holding beer kegs.

There are two factories for the manufacture of ice which run six months in the year and have very moderate success. A supply of snow is gathered in the mountains during severe winters and stored in large holes. This is covered over with some rock salt and pine leaves. During the summer this snow is brought to the city in thick felt bags and disposed of mainly to confectioners. The use of ice is by no means general and is considered very unhealthy in this climate. Since the artificial-ice factories have been established, the use of snow for refrigerating purposes has diminished. The price of either is about $1 per 100 pounds.

The practice of hanging meats, poultry, etc., to ripen is unknown here and meat is generally used within twenty-four hours after killing. As to poultry the time is much less, unless the same is to be consumed by Europeans.

I have great doubts as to the feasibility of introducing American refrigerators into this market with success. Such a thing is not to be found for sale nearer than Constantinople, and the demand there is very limited.

The only firm in Smyrna who deals in American inventions is Jacob Balladur & Co. If any trade can be established for refrigerators here, they can give definite information as to size, prices, and terms upon which the goods can be sold.

W. C. EMMETT,
Consul.

UNITED STATES CONSULATE,
Smyrna, January 15, 1890.

JERUSALEM.

REPORT BY CONSUL GILLMAN.

Refiigerators are not used in this consular district.

No peculiar features, however, would be required in the construction of refrigerators to adapt them for the use of this district.

Ice is not secured in this district, as it rarely forms, and then in insufficient quantity for the purposes referred to. About two years ago a company was formed at Jaffa for the manufacture of ice, but though the artificial article was of excellent quality the enterprise was not sufficiently patronized to prove remunerative, and after a few months' existence was, in consequence, abandoned. Underground cisterns abound in this country and where the preservation of foods and liquids is required they are let down into them and so can be kept for a sufficient time. The thick stone walls of the houses, keeping out the heat, also render refrigerators less necessary than in other warm countries. It is scarcely necessary for me to add that in the present state of things I could not recommend the introduction of refrigerators into this district.

HENRY GILLMAN,
Consul.

UNITED STATES CONSULATE,
Jerusalem, *January* 20, 1890.

SYRIA.

REPORT BY CONSUL BISSINGER, OF BEIRUT.

Refrigerators, in the American sense of the term, are not used in Syria, and until within about a year ago, were practically unknown.

Recently the Beirut Gas Company utilized part of its capacious plant in manufacturing artificial ice. The great heat in the summer and the distance of the works from the city suggested the necessity of providing some means of preserving the ice from too rapid evaporation or melting in transit and during delivery. A small number of wooden boxes were therefor constructed having two compartments, or rather one box placed inside the other with a vacuum of some six inches between the two; this space or vacuum is filled with either sawdust or cork, or both, the inside box—lined with zinc—containing the ice; it is perforated at the bottom to permit the escape of the water from the melting ice.

The dimensions of these boxes are about 4½ to 5 feet long, 2½ feet high, and 1½ feet wide.

A small number of similar boxes, but of more diminutive size, were also made for the customers of the company and were either presented to them gratis to induce them to become clients or sold for a mere

trifle; their cost, the director of the gas company says, does not exceed from, say, 50 cents to $1 for each box. By this authority and others who are most competent to speak on such matters, I am assured that expensive refrigerators would not find a market here, and that anything costing over $1 or $2 could not be disposed of.

Foods and liquids are preserved in the most primitive manner by simply exposing them to the air, as houses are not provided with cellars.

The price of ice per 100 pounds is about $1, the competition with snow, which is a trifle cheaper, having forced the company to establish a low tariff.

Before the introduction of artificial ice, snow was exclusively used in this country and sold at much higher prices than ice does now; but, as people begin to prefer ice, its price has been forced slightly below.

The sale of both ice and snow is, however, very limited, the former not exceeding about 2,750 to 3,000 pounds daily during a period of about five or six months per annum.

From what precedes, it is obvious that American refrigerators could not be sold in this market, nor even so modified as to meet the local requirements of the immediate future.

ERHARD BISSINGER,
Consul.

UNITED STATES CONSULATE,
Beirut, January 20, 1890.

AUSTRALASIA.

REPORT BY CONSUL GRIFFIN, OF SYDNEY.

FOOD PRESERVATION.

Although much attention has been given for some time past by the Government and people of New South Wales to refrigeration and the various methods and appliances for the preservation of food, but little progress was made in the industry until about two or three years ago. In 1886 the New South Wales Government obtained information from the United States as to the methods and processes in use there for the preservation of food, and especially in regard to the transportation of fresh meat in refrigerating cars. Much of the information was obtained from the Department of Agriculture at Washington, and wide publicity was given to it by the New South Wales Government through the public press. Since that time several meat-preserving companies have been established with more or less success, and the governments of all the Australasian colonies have taken deep interest in the subject. The Government of Victoria, not long since, offered a premium of £300 ($1,460) for the invention of an economical means of cooling a chamber for the preservation of milk, cream, and butter, to be used on farms and at factories, and such as would reduce the temperature during hot weather to 50° Fahr. for ten hours without the aid of ice, chemicals, or machinery when the outside temperature would be not less than 120° Fahr. The Government also offered a premium of £300 ($1,460) for a machine of a cheap character which would produce like results; a premium of like amount was also offered for the invention of a chemical means to produce like results, such means to be of a cheap character readily applied. The same Government has also undertaken the erection of a number of cool stores for perishable produce at the various railway stations. Thirty of these stores are now in operation and forty-three others are in course of erection. Several methods were tried with the view of finding out the best design and materials. Trials were made in which terra-cotta lumber was largely used, but the result was not satisfactory. Finally it has been decided that the stores shall be built of wood, with double lining filled with charcoal for the walls, and shingle roof with charcoal ceilings. They are substantially built, and are fitted with thick doors, beveled and padded all round to make the openings air-tight. It is said that the temperature inside the sheds is from 20° to 30° less than ordinary shade heat outside. The stores cost between £300

($1,460) and £400 ($1,945) each, and already about £10,000 ($48,665) has been expended for this purpose. The question of artificial cooling in the storage sheds is under consideration, but the first object has been to create an insulated storage, where perishable products can be placed while waiting for carriage by railway in the refrigerating cars.

The cars that have been built in these colonies for refrigerating purposes can hardly be said to have passed more than the experimental stage, and there is, I think, a splendid opportunity for the introduction of refrigerating cars like those in use in the United States.

The use of ice in private houses in Australasia is comparatively of recent date. American processes for its manufacture have been adopted, and the industry may be said to be fairly started in all the large cities of these colonies. The cost of ice, until recently, was very high, but with the introduction of improved facilities for its manufacture the prices have been considerably reduced. The following are the present quotations: $0.73 to $1.22 per 100 pounds.

The Fresh Food and Ice Company, of Sydney, have recently erected a machine capable of turning out 60 tons of ice per day. Previously their ice plant, which was the largest in the colonies, turned out 20 tons per day. The ice is made on the ammonia-compression principle. This company's new machine has three 20-inch pumps, which draw sea-water from Sydney Harbor at the rate of 100,000 gallons per hour. The company's works include spacious cool-air chambers for preserving meat, fish, and dairy produce, and they have arranged for the sale of fresh fish in Sydney brought in the cool rooms of the Union Steamship Company's steamers from New Zealand. The following list will show the cost of the fish per pound in the Sydney market:

	Cents.
Blue cod	16
Butter fish	24
Flounders	18
Gurnard	18
Kippers (smoked)	18
Soles	24
Salmon	61
Salmon trout	61
Schnapper and bream	12
Trumpeter	24

The New South Wales Co-operative Ice and Cold Storage Company is another of the ice-making companies in Sydney. It was formed to purchase the plant of the Sydney Ice Company, which commenced business five years ago, having erected a machine upon the American Bath-Tevis patent. This machine, however, did not turn out well, and the company, after spending £30,000 ($145,995) was wound up voluntarily. One cause of failure has been put down to want of skill in the erection of the plant, another cause to unsuitable material having been used, the company having, as the secretary reports—

To save money, bought tubing and fittings in London, and the wrong kind of joints were obtained, namely, running sockets instead of tapering, and the black iron tubes butt welded (although they will stand a pressure of from 180 to 200 pounds, and are good of the kind, will not stand the extreme temperature) instead of double lap welded best steam tubing."

The secretary further states that the original company had imported a 6½-ton Guide machine, had altered the Bath-Tevis machine by applying it to ice-boxes, and had converted the large room used under the Bath-Tevis process into storage chambers. The new company has this season imported a third machine on the compressor principle. The ice supplied by this company is in 10-pound blocks, 9 inches square by 5 inches thick, and larger sizes as desired. The cold-storage rooms are largely used by butchers and others, who find it more convenient to send their goods into them instead of keeping refrigerators on their own premises.

An American machine called the "Picket" has been successfully introduced into Melbourne, and it is said several have been ordered for Sydney. It works extremely well. The only objection to it is that certain chemicals required for its use have to be imported here in copper vessels, the whole having to be prepared in the United States. No ammonia is used, the principal ingredient being sulphuric acid. The fact that the chemicals have to be prepared in the United States not only adds to their cost but renders it difficult to keep a regular supply on hand.

REFRIGERATORS FOR DOMESTIC USE.

Refrigerators were introduced in Sydney from the United States. The people were slow to take hold of them, but in time their use became more general. The number sold annually in Sydney is not large and does not probably amount to more than 500 or 600 per annum, one half of which are made in this colony and the remainder imported, chiefly from the United States. American manufacturers have some difficulty in competing with the locally made article on account of the cubic space occupied in transit to Australia, the cost of freight being thus rendered very heavy. If a refrigerator could be made so as to ship in what is called a knock-down condition it could be sold in these colonies at a much lower price. A machine for the manufacture of ice in small quantities is said to be greatly needed in Australia, especially in the smaller inland towns. Such a machine, however, ought to be supplied at a moderate cost. The refrigerators made here vary in size from 2 feet to 4½ feet in height and from 1 foot to 2 feet in depth and from 1 foot 9 inches to 3 feet 10 inches in width.

The following table shows in detail the sizes and kinds of refrigerators on sale here by one of the largest firms. The retail prices are also given in British and United States currency.

No.	Description.	Sizes.			Price.	
		High.	Deep.	Wide.	British currency.	United States currency.
		Ft. in.	*Ft. in.*	*Ft. in.*	*£. s. d.*	
1	1 cupboard, with shelf; also compartment for ice	3 0	1 9	1 9	3 0 0	$14.60
2	....do	3 0	1 8	2 0	3 15 0	18.25
3	1 cupboard, with 2 shelves; also compartment for ice	3 10	1 9	2 1	4 10 0	21.90
4	1 large cupboard, with 2 shelves; also compartment for ice	3 9	1 10	2 4	5 0 0	24.33
5	... do	4 0	1 11	2 10	6 5 0	30.42
6	2 cupboards, with shelves in each; also compartment for ice	3 4	1 8	3 3	8 15 0	42.58
7	2 cupboards, with 2 shelves in each; also compartment for ice	3 8	1 8	3 6	10 15 0	52.31
8	2 large cupboards, with 2 shelves in each; also compartment for ice	4 6	2 0	3 10	12 10 0	61.83
9	1 large cupboard on one side and 2 smaller ones on the other, both with shelves complete; also large compartment for ice in which can also be stored aerated waters	4 8	2 0	4 0	15 0 0	73.00

English manufacturers recommend a consumption of 40 pounds of ice weekly for their smallest refrigerators, ranging up to 150 pounds of ice weekly for the larger sizes.

In 1887 the firm of John Matthews, of New York, manufacturers of carbonated beverage apparatus and supplies, instructed Mr. I. B. Millner to place their refrigerating goods upon the Australasian markets. The portability, strength, and resultant purity of the "block-tin-lined steel fountains" made by this firm was apparent from the first and gained for them a place without difficulty. The introduction of their "draught apparatus," with its ice-box, coolers, etc., met with less favor until its peculiar features became known, when the economy of its working, in connection with reliability of its glass tanks, made it a favorite with the dealer, while his customer readily appreciated the pure, fresh coolness of the beverage produced.

These apparatus are now largely in use in each colony, while the steel fountains are to be found in the leading hotels and many private families, and are growing in favor as a means of developing a popular taste for the natural mineral waters of these colonies. The increased popularity of iced beverages is best shown by the numerous places opened for the sale of such, and the action of Mr. Milner in placing the waters of colonial springs before the public by means of apparatus especially adapted for the purpose can not fail to develop commercial value in what is now an idle element of wealth.

The locally made refrigerators are much heavier and not so well put together as the imported ones, but they appear to answer the purpose fairly well and sell at low prices. Indeed, it is often said that the high cost of the imported machines operates against their use. One firm of manufacturers at Adelaide, South Australia, are said to have succeeded in making a refrigerator at a cost of about one-fourth less than the least expensive of the ones imported. It occupies very little space. The

air is received in a compression-cylinder, subject to a pressure of 60 pounds, and is compressed to about 50 pounds to the square inch and forced through cooling pipes surrounded by water. It is reconveyed into an expansion chamber whence it is emitted at a temperature as low as 23° Fahr. above zero or 10 degrees below freezing point. The cool air is very dry and any snow that may be formed is collected in a snow chamber. The makers propose that this refrigerator shall be used on the railway cars and it can be run by a belt attached to the axle of the car.

The manager of the New South Wales Co-operative Ice and Cold Storage Company, in Sydney, informs me that a refrigerator suitable for the preservation of fish is greatly needed. He states that quantities of fish are regularly brought to the Sydney market packed with ice. They are generally in the boxes about forty-eight hours, but the boxes used are very clumsy and difficult to handle. The kind of refrigerator box which is needed is a portable one, suitable to convey the ice to the different fishing centers and be returned filled with fish. The sides of the box, he states, should be lined with some non-conducting material. It is said, however, that a still better plan would be to introduce American machines for the manufacture of ice in suitable quantities, on the spot, so that the fish and ice could be put into the boxes at the same time and place and conveyed to Sydney, instead of shipping the ice from Sydney and back again.

Several kinds of refrigerators, manufactured by L. H. Mace & Co., of New York, have been introduced in these colonies, the best known of which are the upright refrigerators. There are three sizes of this refrigerator: No. 1 is 19 inches long, 14½ inches wide, and 35 inches high; No. 2 is 25 inches long, 18½ inches wide, and 40 inches high; and No. 3 is 31 inches long, 22 inches wide, and 45 inches high. The three sizes when nested and boxed for shipment occupy 19 cubic feet. The other styles are called the chest refrigerator and the excelsior chest refrigerator. The retail price is from £3 ($14.60) to £10 ($48.67).

Messrs. Hudson Bros., of Sydney, manufacture several kinds of refrigerators, chiefly from American designs. I am informed, however, that at present there is no large demand for them.

COOLING CHAMBERS.

Several cooling chambers, the invention of Mr. J. B. Witt, chairman of the Australian Ventilating Company, limited, have been erected, and they are in use at the Federal Coffee Palace in Melbourne, and at the Grand Central Coffee Palace in Sydney. They have given very general satisfaction. They are constructed on the dry-air principle. A fan or air-propeller is used, which draws the air from any given point and distributes it in the room at the ceiling. The air is distributed in a circular manner, so that there is a total absence of draught. The mechanism of the rotary fan is simple and inexpensive. Mr. Witt has also invented a con-

trivance for cooling the atmosphere by evaporation, and by this invention, when connected with the pipe attached to the air distributer, a low temperature is obtained. The dimensions of the cool chamber in the Grand Central Coffee Palace, Sydney, are 9 feet by 9 feet, and nearly the same height. The air in this chamber is cool enough to keep meat fresh. When it is desired to lower the temperature to 40° Fahr. or 45° Fahr., a small quantity of ice is placed in the refrigerator, through which the supply of air for the cool chamber is drawn. Mr. Witt claims that the superiority of this dry-air refrigeration system over the ordinary ice method is shown in the appearance of the meat, it being as bright and fresh looking as when placed in the refrigerator. Mr. Witt has successfully introduced his ventilating and cooling system in several churches, theaters, and other public buildings. He states that the means heretofore used to carry off vitiated air at or near the ceiling while introducing fresh air from below does not accomplish the desired results, for the reason that carbonic acid gas is much heavier than the outside atmosphere, its specific gravity being 1.524, or half as heavy again, and if an analysis were made the foul air would be found near the floor, owing to its specific weight. Under his system the fresh air is brought from the ceiling and forces out the vitiated mixture at the bottom. The pipes connected with the air distributer are carried through a chest containing ice and salt, which cools the air in transit and at the same time keeps it perfectly dry.

CHILLED-MEAT EXPORT.

The export of chilled meat, which for several years has been conducted at a pecuniary loss in most parts of the Australasian colonies, now seems likely to become a very profitable industry. The trade has made extensive strides during the year 1889, especially in New Zealand. Twenty-seven steamers and ten sailing vessels are now employed in the frozen-meat trade of that colony. Of the steamers, eight are under the flag of the New Zealand Shipping Company. The Shaw, Savill and Albion Line have built three new steamers especially for the trade, and these are marked with an asterisk in the following list:

List of vessels, with names and tonnage of each, engaged in the meat export trade of New Zealand:

Shaw Savill and Albion Line.—*Coptic*, 4,448 tons, 36,000 carcasses; *Ionic*, 4,753 tons, 36,500 carcasses; *Doric*, 4,784 tons, 36,500 carcasses; *Tainui*, 5,031 tons, 36,500 carcasses; *Arawa*, 5,026 tons, 36,500 carcasses; **Mamaria*, 3,583 tons, 36,000 carcasses; **Matatua*, 3,000 tons, 36,000 carcasses; **Maori*, 2,790 tons, 36,000 carcasses; total, 33,415 tons, 290,000 carcasses. The estimated voyages give this line of steamers 798,-400,000 carcasses per annum. New Zealand Shipping Company.—*Tongariro*, 4,163 tons, 30,000 carcasses; *Aorangi*, 4,163 tons, 30,000 carcasses, *Ruapehu*, 4,163 tons, 30,000 carcasses; *Kaikoura*, 4,474 tons, 36,000 carcasses; *Rimutaka*, 4,474 tons, 36,000 carcasses; *Duke of Westminster*, 3,726 tons, 35,000 carcasses; *Duke of Buckingham*, 3,123 tons, 35,000 carcasses; *Duke*, 3,100 tons, 35,000 carcasses; total, 31,386 tons, 267,000 carcasses. The estimated voyages will give this line 728,400 carcasses per annum.

Tyser Line.—*Balmoral Castle*, 3,050 tons, 39,000 carcasses; *Ashleigh Brooke*, 2,863 tons, 38,000 carcasses; *Bayley*, 2,607 tons, 37,000 carcasses; *Star of Victoria*, 3,240 tons, 39,000 carcasses; *Star of England*, 3,511 tons, 41,000 carcasses; *Maori King*, 3,700 tons, 40,000 carcasses; *Celtic King*, 3,700 tons, 40,000 carcasses; total, 22,671 tons, 274,000 carcasses. This line also runs to Queensland, and the estimated voyages are reckoned to be equal to 348,000 carcasses from New Zealand per annum.

Martin Line.—*Elderslie*, 2,761 tons, 28,000 carcasses; *Fifeshire*, 3,720 tons, 28,000 carcasses; *Morayshire*, 3,720 tons, 28,000 carcasses; *Nairnshire*, 3,720 tons, 28,000 carcasses; total, 13,921 tons, 112,000 carcasses. This line is estimated to carry 224,000 carcasses per annum.

Of the ten sailing ships engaged in the frozen-meat trade, seven belong to the Shaw Savill and Albion, of the aggregate of 9,998 tons, with capacity for carrying 87,500 carcasses per annum, while only three belong to the New Zealand Company, carrying 34,000 carcasses per annum. The total carrying power affected to New Zealand, summarized from the above, provides for the transport to England in a single year of 2,220,300 carcasses.

The New Zealand meat export trade began in 1882, when she shipped 8,839 carcasses of mutton. In 1883 the exports rose to 120,893 carcasses; in 1884, to 412,349 carcasses; in 1885 they were 492,269 carcasses; in 1886, 655,888 carcasses were exported; in 1887, 766,417 carcasses, and in 1888, 939,231 carcasses; while in 1889, 1,063,506 carcasses were exported. Thus in eight years New Zealand sent to London no less than 4,459,392 carcasses of mutton, averaging in weight 85 pounds each. The result of the expansion of the frozen-meat trade has been to increase the price of mutton in New Zealand $0.61 per 14 pounds to $1.46 per 14 pounds weight. The Gear Meat Freezing and Export Company, of Wellington, New Zealand, paid a dividend last year of 10 per cent., increased its reserve fund by £2,500 ($12,166), and carried forward, after making large reduction in value of plant, £4,800 ($23,359). During 1889 upwards of 200,000 animals were slaughtered.

The supply of beef and mutton in the seven Australasian colonies is practically inexhaustible. The number of cattle in the entire group is about 11,000,000 head at the present date.

The subjoined table shows the number of sheep, horned-cattle, horses, and swine in the entire group of these colonies for the year 1888:

Colony.	Sheep.		Horned cattle.		Horses.		Swine.	
	No.	*Per cent.*	*No.*	*Per cent.*	*No.*	*Per cent.*	*No.*	*Per cent.*
New South Wales.	46,503,469	48.15	1,622,907	17.49	411,368	27.35	248,583	21.80
Victoria	10,818,575	11.20	1,370,660	14.77	323,115	21.48	245,818	21.56
Queensland	13,444,005	13.92	4,654,932	50.17	324,326	21.56	68,994	6.05
South Australia ..	7,150,000	7.40	430,000	4.64	170,000	11.30	170,000	14.91
Western Australia	2,112,392	2.19	95,822	1.03	41,390	2.75	25,088	2.20
Tasmania	1,430,065	1.48	142,019	1.53	29,238	1.95	43,227	3.79
New Zealand	15,122,133	15.66	*962,200	10.37	*204,700	13.61	*338,500	29.69
Total	96,580,639	100.00	9,278,540	100.00	1,504,137	100.00	1,140,205	100.00

NOTE.—The figures for all the colonies, with the exception of New Zealand, are for the year ended March 31, 1889. In the case of New Zealand the number of sheep is for May, 1888.

* Estimated.

The estimated value for the same period of sheep, cattle, and swine in the seven Australasian colonies is given by Mr. T. A. Coghlan, government statistician for New South Wales, at £33,068,000 ($160,925,422),

of which £21,488,000 ($104,571,352) represents the value of sheep; £6,200,000 ($30,172,300) cattle for meat; £4,144,000 ($20,166,776), dairy cattle, and £1,236,000 ($6,014,994) of swine. It should be understood, however, that the greater part of the value of the stock returns is due to wool. Thus, out of the total quoted, about £17,100,000 ($83,217,150) is the value of wool. If the cost of freight, handling, brokerage, etc., were added the value of clip would amount to about £2,000,000 ($9,733,000) more. Mr. Coghlan, in referring to the food supply of the colonies, mentions that the meat consumed is greater in Australasia than in any other country in the world. He gives the consumption of meat in the colonies at 276 pounds per head of the population against only 69 pounds in Germany, 74 pounds in France, 115 pounds in Great Britain and 120 pounds in the United States; or, in other words, Australasia consumes four times as much meat per inhabitant as Germany and nearly three times as much as Great Britain, and more than twice as much as in the great wheat and meat exporting country, the United States. The surplus exported from Australasia forms only a small fraction of the quantity produced. The increase in cattle and sheep averages about 10.4 per cent. per annum. Of this, Mr. Coghlan states there is needed for the ordinary requirements of food supply, excluding exports, 9.4 per cent. of cattle and 6.8 per cent. of sheep, so that the net increase of the herds of Australasia is about 1 per cent. per annum, and of the flocks about 3.6 per cent. per annum. He says:

Under the most favorable conditions—that is, if there were no losses from failure of food or water—the increase of sheep would be about 24.3 per cent., and of cattle 24.9 per cent., giving a net surplus of 17.5 per cent. and 15.5 per cent., respectively.

Mr. Coghlan, however, states that the frequency of droughts renders the increase of sheep only about 20 per cent., and that if steps are not taken to mitigate the effects of drought and to save part of the unnecessary waste of animal food, the demand for beef will eventually exceed the supply, but that the case is different with regard to sheep, as the supply is never likely to be seriously trenched upon, and a large surplus will always be available to meet the requirements of markets outside of Australasia.

In regard to the machine employed on steam-ships and sailing vessels for the export of meat, the Bell-Coleman and Haslem process appears to be most generally in use, although it is said that the Goodfellow machine is likely to take its place as it does not require to be kept running one-third the length of time. The American De La Vergne machine has also been successfully used, and is said to give very general satisfaction.

The new steam-ship *Matautis*, of the Shaw, Savill and Albion Line, is fitted up with Blythe & Passios refrigerators. There are three of these machines, two forward and one aft. The two forward are of 60,000 cubic feet and 40,000 cubic feet, and the aft machine is of 70,000

cubic feet capacity. The refrigerating rooms have a capacity for 30,000 carcasses of mutton, averaging 80 pounds each.

A considerable portion of the colonial frozen meat passes into consumption in the London market as prime English or Scotch mutton. It is found to be in a thoroughly sound and firm condition and would readily pass for the best home product. Objection is, however, being made to the article being sold as fresh meat. A bill has been introduced into the British Parliament to prevent its sale as such. The proposed bill provides that it shall not be lawful for any person to sell or expose for sale any foreign or colonial meat unless a conspicuous notice is placed over the shop indicating that foreign and colonial meat is sold there. It is further provided that no foreign or colonial meat shall be sold elsewhere than at these labeled shops unless notice is first given to the purchaser in writing to the effect that such meat is foreign or colonial, or unless the purchaser shall have expressly ordered or asked for colonial or foreign meat. Carts used for the conveyance or sale of such meat must also be marked, and there are other clauses of a similar nature.

In most of these colonies one of the principal obstacles to the successful development on a large scale of the frozen-meat export trade is the absence of a safe and convenient mode of bringing the meat to market in the dressed state. The cattle are usually driven through the country to a railway station, where they are shipped on the cars to Sydney; thence they are taken to the abattoirs on Glebe Island, situated not far from the city and sufficiently isolated and open to every breath of air.

The great attention now being given to the meat export trade of these colonies will unquestionably open up a wide and profitable field for manufacturers in the United States of processes and machines for the refrigeration and cool storage of meat, fish, and dairy produce.

Mr. Alexander Bruce, the chief inspector of stock for New South Wales, has favored me with an exhaustive report, under date of May 5, on the chilled-meat trade. From this valuable document I learn that it is now some eighteen years since the late Mr. T. S. Mort, of Sydney, to whom the Australian colonies and New Zealand are indebted for the establishment of the frozen-meat trade, endeavored to form a fresh-meat depot at Lithgow, 96 miles west from Sydney, and although himself unsuccessful in that enterprise, the trade in chilled meat has, in America, become firmly established, and is there supplanting the live-stock trade, as it will before long do in Australasia and throughout the civilized world. Mr. Mort's theory was that with the aid of artificial cold properly applied there need be no more waste, and the correctness and practicability of his proposals are fully borne out in the success of the chilled-meat trade, but more especially in that of the frozen-meat export from the Australian colonies, New Zealand, and America.

Mr. Bruce states that he has for the past ten or twelve years constantly advocated the establishment of a fresh or chilled meat trade,

both on account of the numerous evils which attend the existing live-stock trade and the advantages which must accrue from the change, and he very fully describes the evils of the live-stock trade and the suffering and cruelty inflicted on the stock. He says, speaking of New South Wales, that leaving out of view the hardships stock undergo in the outlying districts (where, as a rule, the feed is comparatively good) when traveling to the nearest railway station, and following them from the time they are yarded there till they are killed at the abattoirs, the treatment they receive in reaching Sydney from an outlying station like Bourke, 503 miles west from Sydney, is cruel and wasteful in the extreme, for they are between seven and eight days without any food, made up as follows:

In yarding, trucking, and despatching, say, from Bourke, 10 hours; on the cars to Homebush, near Sydney, unloading there and yarding, say 40 hours; lotting, selling, and removal to paddocks at Leichhardt, a suburb of Sydney, 15 hours; in waiting paddocks there (for as a rule the cattle purchased at one sale remain in these paddocks until next sale day, and a fresh lot have been purchased, before they are sent to the abattoirs), say, 84 hours; at the abattoirs waiting slaughter, say, 24 hours; total, 173 hours; that is, 173 hours, or 7 days 5 hours without any food, and sometimes without water.

It thus appears that a considerable portion of some 1,500 head of cattle and 15,000 sheep are week after week subjected to the terrible torture of five, six, seven, or even more days' starvation, till the cattle may be seen at the abattoirs with their heads hanging down, their bellies tucked up to their backs and looking utterly miserable and wretched. Nor is this all. The poor animals in trucking are terrified, beaten, and bruised, and when in the cars they push and horn each other, while the stopping and shunting often throw them down, and some are not infrequently trampled to death. The losses of cattle on the cars and the bruises so noticeable on their bodies when killed show conclusively the cruelty now inflicted on the animals under the live-stock trade and, as Mr. Bruce says, "with the terrible starvation which that system entails, cries aloud for a thorough change."

With reference to the waste and deterioration of the meat Mr. Bruce says that the shrinkage in weight alone is a serious matter; for if quiet, fat cattle in England, carefully driven short distances, and fed two or three times a day waste, on an average, over 8 pounds in twenty-four hours, it is certain that the loss in weight on the comparatively wild fat cattle of New South Wales must, till they reach the killing-pen, subjected as they are to the barbarous treatment and starvation from which they now suffer, waste nearly double that amount, and that the shrinkage in their case will amount to 12 or 14 pounds a day, which again for seven or eight days would on an average be at least 100 pounds per bullock, *i. e.*, one-eighth of the whole weight and the very best of the meat.

As to the deterioration in the quality of the meat, I learn from the

report that it is notorious the meat supplied in Sydney is, as a rule, inferior, tough, and void of flavor, especially in bad seasons. It is, in fact, after the cruelty and starvation to which the cattle are subjected, simply hard, well-trained muscle, with all the primest and most nutritious part of the meat gone, which not only renders it dear and innutritious to the consumer, but, so far as the beef is concerned, utterly unfit for export to London; while, as regards the frozen mutton now sent from Sydney to London, it on an average brings two-thirds penny per pound less than the mutton from New Zealand.

Mr. Bruce says the remedy for this unsatisfactory state of things is simple. It lies in the preservation of the quality of the meat by artificial cold, which can be obtained at a comparatively trifling cost. On or near its own pastures the meat is as good as any in the world, and if only conveyed from the pastures to market without deterioration it is an article in every way fit for local consumption and can be offered with confidence in any market, either in a fresh, frozen, chilled, tinned, or salted state.

Mr. Bruce's recommendations are:

(1) To kill the stock at the main centers of the stock traffic on the railways, as near the pastures on which they are fattened as possible; or, if they have traveled any distance, to keep them in paddocks near these centers where they can get plenty of good grass and water for six, eight, or even more days, till they are well rested and cooled down and thoroughly free from fever.

(2) To send the meat, with as little handling as possible, to a chilling-room cooled down to 36° F. in winter and moderately cool weather; and in the summer time down to 33° F. (just above freezing), in order to have a good surplus of cold to meet the loss which takes place in the transit when the weather is warm, and thus do away as far as possible with the necessity for providing ice by the way. The meat for consumption in Sydney could in this way afford to lose, say, 30° F. (the car would then only be 53° F.), and arrive perfectly safe. The cost of chilling would in the height of summer be, say, 61 cents per body of beef from Bourke or Hay, with the temperature at 100° F. in the shade.

(3) To put it late in the day into non-conducting meat cars (which would also be cooled down to the temperature of the meat, and send it by train at a speed of at least 20 miles an hour to market; and

(4) To run the cars, on reaching Melbourne or Sydney, into a meat market provided with the necessary appliances for cooling and keeping the meat, and there, according to the state of the market, either dispose of it to the retail butchers, send it to the chill-room (where it can be kept perfectly sound far a fortnight) to wait a better market, or prepare it for exportation as frozen, chilled, tinned, or salted meat.

A proper chilled room to protect the meat should it not be sold on arrival is a *sine qua non*. It was the want of this that was one of the principal causes of the failure of the Orange Company to establish a

fresh-meat trade, for as the company had no means of protecting the meat when not sold, they had to take the price offered by the retail butchers or allow it to stink. They were, in fact, largely at the mercy of the trade; whereas with a proper chill-room the salesman could put the meat in and wait a fortnight if necessary for better prices, to say nothing of the other outlets secured by a proper system of artificial cold.

In reporting on the success of the fresh-meat trade in the United States Mr. Bruce acknowledges the assistance the project derived owing to information obtained from America in the following words:

Mr. Gilderoy W. Griffin, consul for the United States, who has done so much to make our resources known there and to promote trade between the colonies and America, kindly obtained from the Commissioner of Agriculture, Washington, an exhaustive and very valuable report on the fresh-meat trade in the United States, which showed that the fat-stock trade in America, in spite of the powerful vested interests which exist there, was fast becoming a fresh-meat one. In the short space of six years the volume of the fresh-meat trade from the Western to the Eastern States of America, which only began in 1880, had increased with great rapidity, and has by this time overtaken and passed that of the live-stock trade; and the Commissioner of Agriculture in reply to the question whether the fresh-meat trade is likely to increase very tersely observed that, "it must continue to increase unless there should be a revolution in trade affairs and in the desire of the people to obtain the best meat for the smallest outlay," a contingency which it would be simply absurd to suppose would ever arise.

I learn that during the five years from 1881 to 1885 the growth in dressed meat was: From 1881 to 1882 the increase was 42.5 per cent. over the trade of 1880; in 1882 the gain was 52.3 per cent.; in 1883 it was 127.5 per cent.; in 1884 it declined to 23.6 per cent.; and in 1885 it was 25.2 per cent.

The Mark Lane Express, London, in January last, says:

The dressed-beef business has driven the carcass-butcher out and is the coming method of handling beef in America.

And the Daily News, London, says:

There are enormous numbers of us able to regale ourselves on the roast beef of old England brought straight from Chicago.

As to the success of the fresh-meat trade in Australia in 1889-'90, Mr. Bruce says that it is still asserted by some in the meat trade that though the system has proved a success in America it may not answer in Australia, but that fortunately it is not necessary to be dependent on American experience, for through the energy and enterprise of Mr. Robert Hudson, of the firm of Messrs. Hudson Brothers, of Sydney and Melbourne, the reports of the success of the fresh-meat trade in America have been fully confirmed by the experimental trips he has made with his refrigerating cars from Narrandera and Narrabri to Sydney, which were thoroughly successful, not only as regards the condition of the meat on its arrival in Sydney, but also as regards expense and the owners' net returns.

With the view of showing the advantages still more clearly Mr. Bruce supposes a case where two fat bullocks of the same weight at Bourke are sent to Sydney. One of them is sent alive and sold at Homebush, and the other killed and chilled at Bourke and the carcass sent, with the profitable offal, by refrigerating car to the meat market, Sydney, by which means, he states, there is a saving of at least 10*s.* ($2.43) per bullock to the owner, while the indirect advantages to the stock-owner, owing to the superior quality of the meat and the price it will bring in the London market if frozen and shipped, are of great moment.

KILLING AND CHILLING DEPOTS.

With regard to who should erect killing and chilling depots Mr. Bruce advocates the construction of these depots by joint stock companies, formed to a considerable extent by trades-people in the towns near which the depots are to be established, but principally by the stock-owners in the areas from which the stock would be brought to the depots for slaughter and chilling. He would have these companies to act as agents for the stock owners and dealers, take delivery of the stock and kill and chill them, forwarding the carcasses on owners' account to market in the refrigerating cars, for which they would supply the ice when required, charging a moderate amount for their services, which would to some extent be paid for in offal.

Mr. Bruce has consulted one of the leading mechanical engineers in Sydney, who has given the question of cost special study both in Australia and in America, and he understands that the cost of the necessary buildings and of a complete chilling and ice-making plant, together with yards, slaughter-houses, land, etc., for an establishment capable of dealing with, say, 120 cattle or 1,200 sheep a day, and supply the necessary ice for transit, would be £12,000 ($58,398), while the working expenses of such a depot, including interest on cost of plant, wages, coal at £2 per ton, water, ammonia, sundries, etc., would bring the cost of chilling a body of beef weighing say, 800 pounds, to 48 cents.

On the question as to who should provide the refrigerating cars Mr. Bruce says, while it is taken for granted that the trades-people in the more important towns will co-operate with stock-owners in the surrounding country to form companies for the erection of killing and chilling depots, he believes that the Government railway commissioners are the proper body to supply refrigerating cars, the companies not only supplying the cold for chilling the meat, but also the ice for keeping the cars cool. He states that an endeavor was made to form a metropolitan company to rent the meat market and chill-room in Sydney from the railway commissioners and, where necessary, to assist the up-country killing and chilling companies in the construction and working of their depots.

The promoters of the Metropolitan Company also proposed that they

should find the refrigerating cars, that the cars should be hauled by the railway authorities at a stated rate per ton, and that the railway commissioners should have the use of the cars for back loading.

Mr. Bruce, however, points out several objections to this arrangement and among others mentions the following:

(1) It would take a great deal of capital to provide the necessary cars, and shortness of funds is one of the principal drawbacks to the formation of the proposed Metropolitan Company.

(2) The question of who should make the repairs to the cars would be a difficult one to settle, and it would, I am afraid, be at times impossible to say who should do so.

(3) The Commissioners would be able, besides conveying the fresh meat, to make much more use of the refrigerating cars than the company in carrying milk, dairy produce, fruit, and game to Sydney, and fish and other perishable articles up country.

REFRIGERATING CARS.

Mr. Arthur G. Kenway, superintendent engineer in charge of the New South Wales Government works connected with the meat trade, has furnished me with an account of an experimental trial of a refrigerating car designed by him. He states that his method consists in placing meat chilled in simple insulated cars, without ice or other artificial cold-producing agents, trusting simply to the insulation of the cars and the cold stored in the meat to effect the purpose for the shorter distances, and for those longer to recharging the cars with cold air at intervals from stationery machinery if found necessary.

The car which Mr. Kenway designed was divided into three sections, the first containing the refrigerator; the second was the insulated chill-room; the third section contained a tank of a capacity of 750 gallons. The refrigerator was one of the Bell-Coleman and Hastem pattern, dry cold-air machines, capable of discharging 5,000 cubic feet of cold air per hour. It was connected with the boiler of the locomotive by a flexible rubber steam-pipe, and it discharged its cold air into the insulated chill-room, the walls, floor, and ceiling of which were built in the manner Mr. Kenway proposed should be done for the permanent insulated cars, with 5 inches of woolen flock packed between two inner and two outer thicknesses of 1-inch tongued and grooved pine boards which had a layer of paper felt between them, except on the floor, which had a layer of waterproof paper instead.

If chilled meat had been procurable up country, Mr. Kenway states, a simple insulated car would have been all that was necessary for the experiment. The meat, namely, six quarters of beef and five bodies of mutton, was previously chilled by the cold-air process at a private establishment in Sydney in order to economize time, and was put into the car shortly before leaving Sydney on Sunday night, the 17th of March. A start was made at 9 o'clock, and the refrigerator in the car was kept

at work for a period of sixty-five minutes. The meat and the room then showed a temperature of 30° Fahr. The machine was then stopped until Nyngan was reached, a distance of 343 miles. This portion of the journey occupied twenty-two and one-half hours. A number of delays occurred before the car reached Bourke, 503 miles from Sydney, where the temperature was found to stand at 50° Fahr. The temperature outside the car during the greater part of the trip varied from 57° Fahr. to 80° Fahr., and while traversing the plains the thermometer ranged from 80° Fahr. to 98° Fahr. on the sides of the car, in the shade, while in motion. On the return journey the temperature was reduced to 30° Fahr. before leaving Bourke, and from that time until Sydney was reached the machine was never used. The meat when removed from the car was found to be in prime condition, firm and cool, its temperature being 46° Fahr.

The most desirable temperature for meat to stand at when delivered is believed to be 60° Fahr., so that the journey might have been continued eight or ten hours further with safety. Mr. Kenway states that the results of the experiment show that it is possible to convey chilled meat in simple insulated cars for the longest journeys in New South Wales without the aid of any refrigerating appliances during the hottest weather if the meat is properly chilled before being placed in the insulated cars, the temperature in which being reduced to 30° Fahr., the explanation being that sufficient cold is stored up in the chilled meat to answer all requirements on the journey.

It is doubtful whether the Government will construct cars on this pattern, as it is believed they are too heavy and expensive.

The Messrs. Hudson Brothers, who have constructed several refrigerating cars for the Government railways, are taking steps to introduce into Australia refrigerating cars made by the Wikes, the Zimmerman, and the Riordan Manufacturing Companies, of Chicago, Ill. The Messrs. Hudson Brothers had on exhibition at the Metropolitan show near Sydney on the 7th April last, a chill-room similar to those they propose to erect in the country districts. A number of sheep killed at Bourke seven days previously were brought to the Metropolitan show and hung up in this chill-room. The fine condition of the meat and the ease with which it was conveyed to Sydney were subjects of commendation by those interested in the exhibition. The Messrs. Hudson Brothers state in a communication to me that they have had much difficulty in selecting a suitable machine for the manufacture of ice; that they have visited every place where these machines could be procured in Europe and America, but up to the present time not one seemed to answer their purpose. They state:

> Our great effort has been to find an economical machine which we could use in connection with the chill-room. The machines with which we are most pleased are the Goodfellow and the Kilbourn & Co. The latter is an American machine and will probably be adopted by us.

The Messrs. Hudson Brothers state that the De la Vernue machine is a good one, but very costly and scarcely suitable to take a long distance into the interior of this continent.

G. W. GRIFFIN,
Consul.

UNITED STATES CONSULATE,
Sydney, May 6, 1890.

NEWCASTLE, N. S. W.

REPORT BY COMMERCIAL AGENT DAWSON.

The majority of freezers in use in this consular district are of American make. There is no great quantity of them nor any great demand for them, but the leading hotels and restaurants have them, and some private families. Their size varies from 3 feet 6 inches by 2 feet 6 inches, to 5 feet by 3 feet 6 inches, *i. e.*, the size of the box. Those used in restaurants have cooling ovens with ice chambers at the top and water chambers at the sides. Those in hotels are shelved off for holding liquids, bottles, etc. They cost from $25 to $75. Ice is imported from Sydney at present, and retails in 14-pound blocks at 36 cents per block. It probably costs the importers 75 cents per 100 pounds in Sydney. There was an ice manufacturing establishment here, but it collapsed. There is room for another. Refrigerators are brought here from Sydney, but there is no reason why they should not come direct from the United States.

THOMAS M. DAWSON,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Newcastle, February 13, 1890.

NEW ZEALAND.

REPORT BY CONSUL CONNOLLY, OF AUCKLAND.

The subject of refrigerating machines is one of considerable magnitude in New Zealand, embracing as it does one of the most important industries of the colony. I found at the outset that in order to obtain thoroughly reliable information I must visit a few of the great "freezing works" in several localities throughout the country.

All the refrigerating machinery used in New Zealand is manufactured in England, and is known as the "Haslam dry-air refrigerator," and is used exclusively for freezing beef and mutton for export to the London market.

Owing to the fact that there are no small freezing machines in use in this colony, the people are of course unfamiliar with the benefits to be derived from the use of the smaller refrigerators as used in the United States.

As to the best means of introducing American refrigerators, I find is a most difficult matter to suggest a practical method of doing so successfully, for many reasons. The American refrigerators are comparatively unknown in this colony, and until their superiority is established beyond any possibility of doubt the people would be slow to favor them, especially as there is an impression prevalent here that American refrigerating machinery is not adapted to the use most required here, viz, meat freezing. Those who are engaged in this business, and presume to be familiar with all the necessary requirements of the trade, claim unhesitatingly that the American refrigerators could not be utilized as economically or as advantageously as the English-manufactured machine. Consequently, in view of the prejudice that already exists against the American machines, it would, as I have already stated, be difficult to advise intelligently concerning the successful introduction of our American-made refrigerators.

Perhaps the most economical manner of introducing some of the smaller refrigerating machines for the preservation of food and liquids would be for some of our American merchants who have correspondents in this colony to ship a few sample machines to such correspondents with full and complete instructions. This I have no doubt would be much the cheapest and least expensive way. But a far more satisfactory method would be to send a duly authorized agent with the machines one who would be capable of publicly demonstrating the capacity and utility of our American refrigerators. This would undoubtedly be far the most desirable and practical manner of bringing out machines successfully

and satisfactorily before this public. The advantages derivable from an authorized agent presenting the machines as compared with those of a local resident agent are numerous and must readily suggest themselves to the manufacturer. The American agent would thoroughly understand his business, and for this reason would inspire the public confidence while the resident agent would be ignorant of the proper methods employed to produce the most satisfactory results, thus practically destroying in the beginning whatever chance there might be of introducing our American-made machines. No matter how meritorious the machine may be the uninitiated when testing it under the gaze of a prejudiced and critical public might fail utterly. Therefore, if ever an effort is made in this direction, I would strongly urge the unmistakable necessity of sending a thoroughly reliable and practical person to represent the goods, as much will depend on the ability of the representative, presuming, always, the machines are useful and adapted to the requirements of the people of this colony.

The manufacture and sale of ice in this colony is very limited indeed. Machinery intended for the manufacture of ice alone would not in my opinion pay here. Ice is not used in any considerable quantities, as the climate in most parts of New Zealand is mild and equable, and in consequence of this the necessity for ice is correspondingly reduced. Whatever ice is required is procurable from any of the "freezing works" throughout the colony and at very reasonable rates, considering that none are manufacturing it specially for sale. Ice is obtainable at the rate of 1 cent per pound.

The following will afford some idea of the size, cost, and capacity of a few of the refrigerators in use in this consular district.

In the Christchurch district there are two meat-freezing establishments, both of which machines are manufactured by Haslam & Co., Derby, England, as, indeed, are all the machines used for freezing purposes in the colony. I will give the size and power of one of those in use in Christchurch, which will suffice for both. One of these machines is capable of delivering 110,000 cubic feet of cold air per hour. The cost of this machine in England was $18,248.87.

There are also two freezing works in the Wellington district. The Gear Meat Preserving and Freezing Company of Wellington have two machines, each capable of discharging 45,000 cubic feet of cold air per hour. The cost free on board in London was $13,139.55. This company will have an additional machine in about two months hence, with a capacity equal to 150,000 cubic feet of air per hour, which will cost, including condensers, free on board, London, $21,899.

The Wellington Meat Export Company have three refrigerating machines in constant use. Two of these machines deliver 120,000 cubic feet of cold air per hour, at a temperature of about 70 degrees below zero at the point of discharge. The third delivers about 50,000 feet of air at about the same temperature. The two larger machines will

freeze 500 sheep per diem, while the smaller will only freeze about half the above number. They are all air-compression machines. The larger ones cost in London $17,032, while the smaller one would be supplied now for about $10,949.32.

This company has been sending away for the last six months an average of 1,100 cattle and 17,000 sheep per calendar month.

It may be said of all the machines used in this colony for meat freezing purposes that no special or pecular features are required, except that they have to be adapted to freezing large quantities of meat in a short time. None of these machines are used for chilling or storing meat for local consumption.

It may be somewhat interesting to many to get a pen picture of one of these great meat-freezing works and the *modus operandi* of meat-preserving and the disposition made of a sheep from the time it enters the slaughter-house until the final process is gone through with. For this purpose I will select the freezing works of Nelson Brothers, at Tomvana, near Napier, N. Z., commencing with the slaughter-house, which is a long shed where the sheep have arrived at the "sticking point" and come under the hands of twenty butchers who are busily engaged killing, skinning, and dressing them. Through this shed runs a miniature railway, which takes away the fat to the boiling-down house, the skins to the fell-mongery, the intestines in due time becoming fiddle-strings to charm or torture as the fates decree. Overhead are a number of rails on which run friction rollers, to which the carcasses are hooked, and here they begin the long journey which is to end in London. Along these rails they are rolled into the cooling-room, in which they remain till all their animal heat has been expelled, when they are passed into the refrigerating chambers, where they are frozen for thirty-six hours, by the end of which time they give out a bell-like sound when struck. From these chambers (which hold from 200 to 600 carcasses) they are removed to storing-rooms, and in due course are taken away to the port of shipment in specially constructed railroad cars; 1,400 sheep can be prepared per day, and there is storage for 40,000 carcasses.

From the slaughter-house we pass to the boiler-house, in which we find, in addition to four 20 horse-power boilers, a striking novelty in the shape of a 60 horse-power Babcock and Wilcock boiler, in which the steam is generated in groups of tubes between which the heat from the furnace circulates; which tubes depend from a horizontal steam-drum mounted on trunions at its ends, which arrangement allows for an unequal expansion of the parts, the drum being luted to the brick setting inclosing the tubes. The flues of all the boilers lead into one of "Green's Economizers," containing 168 tubes 12 feet long and 4 inches in diameter, for heating the feed-water which is passed through them on its way from the condensers to the boilers, and is thus heated by the waste heat circulating between the tubes.

Adjoining the boiler-house is the refrigerating machine. Here are

four Haslam dry-air refrigerators busy at work, in which the air on its way to the freezing chambers is first heated by compression, then cooled by passing through pipes surrounded by cold water, and then passed into a chamber containing dry-air pipes. After passing through these pipes the air is expanded, by which means its temperature is reduced to 80° below zero. It then passes through air trunks into the freezing chambers, and, after doing its duty, passes back through exhaust trunks to the compressors. In the freezing chamber the cold is indeed most intense—frost on the roof, on the walls, on the floor, and here and there a little snow. In this chamber are countless carcasses undergoing the freezing process.

The engine-room and freezing-chambers are lighted at night by a Siemens electric light, the dynamo for which is driven by a 3 horse-power engine.

Leaving the engine-house we pass two large reservoirs, from which 700,000 gallons of water are daily passed through the machines.

Entering the wool-shed, here is an invention which will probably revolutionize all those processes in which wool requires to be dried after being washed, dyed, etc. Sheep-raisers, fellmongers, wool-scourers, and dyers have long sighed for some inexpensive and efficient apparatus which should render them independent of the weather and enable them to do their work with satisfaction, precision, and absolute certainty. This desideratum is at last supplied in these patent wool-drying machines, two of which are here at work, and by which the wool to be dried is exposed to a blast of warm air so that its fibers may be repeatedly acted upon thereby and thus be regularly and rapidly dried, the dried wool being expelled from the machine by means of the blast. Each machine consists of a sparred drum, open at both ends and revolving on friction-rollers in a casing, between the bars of which (drum) air is forced from a longitudinal air-trunk. The interior of the drum is furnished with sparred shelves which, as the drum revolves successively, take up portions of the wool and allow them to fall, and thus expose them fully to the current of air, and also shake out any dust or other foreign substance, which in itself is a great advantage. Both drums are 8 feet in diameter, one being 14 feet long and the other 30 feet. The shorter drum is worked intermittently; that is, a charge of wool is thrown in at one end and when dried is blown out at the other by turning on a blast. In the longer drum the feeding and discharge of the wool are carried on continuously, the wool fed in handfuls through a hopper at one end, and the blast from the air-trunk being directed by means of adjustable "feathers" on to the wool in an oblique direction, so that the blast both dries and propels the wool through the drum. The apparatus, which is exceedingly simple in construction, can in two hours be taken to pieces for transmission, and as readily set up on its arrival at its destination. Upon examination the dried wool is found to be of an extremely silky luster. I have devoted considerable space to

this "wool-drying" apparatus in the hope it may be interest to the wool-growers and others interested in the wool industry in the United States.

One noticeable feature around these great meat-preserving establishments is that there is positively no waste. Everything fit for human consumption is utilized and prepared in the most careful and painstaking manner. Thus the skins of the refrigerated sheep are cured for subsequent manufacture into parchment, "morocco," and "roans;" the clippings from the pelts are washed and dried by patent machines already referred to and turned out as short wool; the kidneys, tongues, etc., are tinned, and even the horns and bones of the bullocks are sent to the bone-dust factory to be ground, and thus again assist in the production of additional comforts for mankind. In my description of the cooling chamber I find I have omitted some important details. The cooling-room is constructed with a double ceiling, through which a current of air is drawn by a fan driven by a donkey-engine. In this cooling-room the carcasses are permitted to remain for 10 hours, when all the animal heat has been expelled. The carcasses are then placed in the refrigerating chamber, the walls, floors, and ceilings of which are insulated with a charcoal lining, and the cold-air is supplied through an inlet air-trunk direct from the engine, and afterwards passes back to be cooled down and used over again. By this means there is a constant circulation of cold air thoughout the freezing-chamber.

All the steamers and sailing vessels plying between England and New Zealand and engaged in the frozen-meat carrying trade are supplied with Haslam refrigerators. It is asserted that 95 per cent. of all the frozen meat placed upon the London market is treated by the Haslam process.

There are seven refrigerating machines in the Auckland district, with a capacity ranging from 2,000 to 120,000 cubic feet of cold air per hour.

The cost of the smaller machines is about $3,400 each, while the cost of the larger machines, those capable of discharging 120,000 cubic feet of air per hour, is $17,032 in England.

There are ten large meat-freezing establishments in the colony and about five smaller ones, as near as can be ascertained. The total number of Haslam refrigerating machines in use in New Zealand for meat-freezing purposes are twenty-six. It is asserted by all who are interested in the frozen-meat industry that "the American ammonia machines" are useless for meat freezing, consequently could not be sold here at any price for meet-freezing purposes.

JNO. D. CONNOLLY,
Consul.

UNITED STATES CONSULATE,
Auckland, May 9, 1890.

WEST AUSTRALIA.

REPORT BY CONSULAR AGENT SANDOVER, OF FREEMANTLE.

Refrigerators are not used in this district, ice at the present time not being manufactured here. From my knowledge of the American refrigerators I believe that when ice is manufactured here, which will be when the population becomes larger, these refrigerators will be the most suitable kind for the place.

Regarding the best manner of introducing them, I think the best way would be to instruct the manufacturers to send circulars and prices to this consular agency, and I would see that they were distributed among dealers.

WILLIAM SANDOVER,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Freemantle, March 6, 1890.

POLYNESIA.

FIJI.

REPORT BY COMMERCIAL AGENT ST. JOHN, OF LEVUKA.

There possibly may have been a half dozen refrigerators brought here from England several years ago when the colony was more prosperous, but on account of the impossibility of getting ice they have gone into disuse.

Ice is at present manufactured in very small quantities and at very irregular intervals. The price demanded for it is 12 cents per pound or $5 per hundred-weight.

As to the conditions which prevail relative to the preservation of foods and liquids, it is the very simple way of placing them in a well-ventilated safe (usually of wire netting) and placed in as cool a shade as possible, either under the shade of the house or of trees as most convenient.

No attempt is made, however, at keeping them for any length of time.

As to whether American refrigerators could be so modified as to meet the local requirements in the absence of ice, I am unable to say.

In consideration of the small trade that could, even under favorable circumstances, be realized in this colony, I could only suggest but one way for the introduction of refrigerators here, and that would be through New Zealand or the Australian colonies. That is, that they be reshipped from houses dealing in such goods in those colonies to this colony of Fiji.

ANDREWS A. ST. JOHN,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Levuka, April 9, 1890.

HAWAII.

REPORT BY CONSULAR AGENT FURNEAUX, OF HILO.

Refrigerators are in use by the foreign families resident in this place. The ordinary kind, such as are in common use in the United States, fully meet the requirements of this community. Those in use here are manufactured in San Francisco, Cal., and in Buffalo, N. Y.

The average size is 2 feet 6 inches by 2 feet 10 inches; height, 3 feet 8 inches outside measure.

Ice is manufactured here and furnished at $3 per 100 pounds. The machine in use was made in San Francisco.

CHAS. FURNEAUX,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Hilo, February 10, 1890.

CONTINENT OF EUROPE.

AUSTRIA.

REICHENBERG.

REPORT BY COMMERCIAL AGENT HAWES.

No refrigerators are for sale here. Owing to the cold climate, they are little needed and are either made in a primitive manner by a carpenter or are ordered from Prague or Vienna. As they are only in the possession of private parties, it is impossible to procure any valuable information on the subject. Reichenberg is too small a city to do any direct importation from the United States, but perhaps if American refrigerators were introduced in Prague and Vienna, a limited number would be ordered here. The demand, however, would be so small that I am convinced that a couple of dozen would meet the demand for a a year.

Consignment to responsible firms would be the only way of introducing such articles to the trade in this city.

JNO. B. HAWES,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Reichenberg, April 11, 1890.

TRIESTE.

REPORT BY CONSUL HARTIGAN.

Refrigerators are used everywhere in this consular district. They are mostly made in Germany, Austria, and a few in Trieste.

The natural ice for local use and export is obtained from the surrounding mountains (Karst), small lakes, rivers, etc.

There is one establishment for the manufacture of ice, that of Heinrich Ritter von Zahony, where the ammonia process is employed; Linde patent.

The population of the Karst being extremely poor, ice is sold by them according to the season, between 20 and 40 soldi per 100 kilos, or an average of about 7 cents for 100 pounds. The artificial ice is considered a purer quality and commands a price one-third higher.

The system in vogue by butchers and others for preserving meats, etc., is somewhat similar to that in the United States.

Verderber & Co. are the principal agents and dealers here in refrigerators; they are enterprising men, and the best way, in my judgment, for the introduction of American make would be through them, if they were furnished with an illustrated catalogue of some large manufacturer, giving full particulars, dimensions, prices, etc. The price, I need not say, is an important consideration to compete with European production.

JAMES V. HARTIGAN,
Consul.

UNITED STATES CONSULATE,
Trieste, January 24, 1890.

BELGIUM.

ANTWERP.

REPORT BY CONSUL STEUART.

Refrigerators are used in this consular district not so generally, probably, as they would be in a city of the same size in the United States, but an appreciation of their convenience seems to be growing, and may increase the demand for them. It is difficult to say about how many are sold, but a dealer who handles more than any other one in the city told me he disposed of say from forty to fifty a year.

Those on sale here are manufactured in Germany, and are constructed similar to those in use with us at home. As they are of comparatively recent introduction, they are, I am sure, imitations or copies of those made in the United States and exported to Germany. The formation, therefore, is almost the same; the sizes range, according to a German price-list that I saw, from 50 by 65 by 76 centimeters to 88 by 185 by 188 centimeters. Then there are extra large sizes made for the use of restaurants and hotels, and also others constructed to hold beer in the keg or barrel, the smaller ones with single door and shelf, the larger ones with double doors—shelves on one side. They are made of wood, painted, and lined with zinc.

The ordinary sizes for family use here range from 50 by 65 by 76 centimeters, to 60 by 100 by 110 centimeters. The cost price of the former is 28 francs or $5.40, and the larger 82 francs, or $15.82 delivered in Antwerp. Extra large-sized ones are sold at from 200 to 275 francs by the retailer.

It is obvious that as price must be the main consideration in the effort to introduce the American refrigerators on this market, it will be necessary for the manufacturer to satisfy himself that he can place his product in successful competition with those now on sale here. It must be done at a price that will enable the dealer to sell as low or lower than he does his German ones, and find as much profit in them. An advance in price on account of any claim for superiority in any particular, however well-founded, will have no effect. They will buy the cheapest and remain true to them until convinced by experience in the use of others that they are as good or better than the ones they have been accustomed to.

In regard to the manner of introducing any goods upon a foreign market, there are several ways—as, for instance, by personal effort of an agent sent for that purpose; by sending a consignment of the goods, if a dealer, can be found to receive and offer them; by procuring the names of parties dealing in the goods; and then by means of corre-

spondence and circulars or price-lists printed in the language of the country, inducing them to make a trial. In the latter method the consul can and is often called upon to give the names of parties in his district engaged in the various branches of trade.

The small quantity of natural ice gathered during the winter is of no importance, and manufactured ice is in general use. There is a large company here engaged in that business, and the price is about 10 francs per 500 kilograms or $1.93 per 1,000 pounds. They furnish tickets to families, 25 tickets, at a price of francs, 12.50, each ticket calling for 25 kilograms of ice.

JOHN H. STEUART,
Consul.

UNITED STATES CONSULATE,
Antwerp, January 28, 1890.

BRUSSELS.

REPORT BY CONSUL ROOSEVELT.

Although the use of refrigerators is yearly increasing in this consular district, the general use of same is considerably less than in any section of the United States.

Refrigerators for this market are of domestic and foreign manufacture, made of various kinds of woods, in all sizes and forms, without any special or peculiar features, but more or less imitations of American refrigerators. Prices for domestic production varies from 46 to 200 francs each, according to size and quality of wood. English refrigerators vary from 45 to 150 francs, and the German article from 46 to 160 francs each.

Different varieties of refrigerators are employed here in breweries for cooling beer. The most popular are the Schmidt, Mennig, and Briggs. The Schmidt patent is most generally used in this consular district.

Upon inquiry at the different establishments dealing in refrigerators I discovered only one firm, C. Duhot & Co., No. 3, Vieux Marcheaux Grains, Brussels, willing to accept an agency for the sale of American refrigerators. Mr. Duhot stated that, some years ago, he introduced American stoves on this market; that he is more than satisfied with the result of the venture, as the demand for this merchandise steadily increases. He is consequently favorably disposed to handle American refrigerators, provided American manufacturers are inclined to furnish said goods at equally advantageous rates as English and German producers.

I would suggest, as the most practical and satisfactory manner of introducing American refrigerators on this market, that manufacturers send samples of goods and arrange to have them presented to trade by intelligent, active agents, having a perfect knowledge of the French language.

ICE SUPPLY.

Ice for domestic consumption is largely procured from natural ponds and lakes in the provinces of Brabant, Hainaut, and Namur, large quantities are manufactured at the several ice-manufactories situated at Brussels, and a small amount is annually imported from Holland.

Price for ice for domestic use, 8 francs ($1.54) per 200 pounds. Wholesale price, 5 francs (97 cents) per 200 pounds.

I inclose cuts of different refrigerators in use here.

Nos. 1 and 2, refrigerators for preserving food. No. 3 Mennig, No. 4 Briggs, Nos. 5 and 6 Schmidt, for cooling beer.

DESCRIPTION OF SCHMIDT PATENT.

The Schmidt refrigerator is manufactured at Bretten, Baden. It has a cooling capacity from 8 to 40 hectoliters per hour. It is made of the best sheet brass, plated with pure tin. This apparatus consists of three parts, as follows: (1) Distribution pan, C; (2) reeded cylinders, D; (3) receiving basin, K.

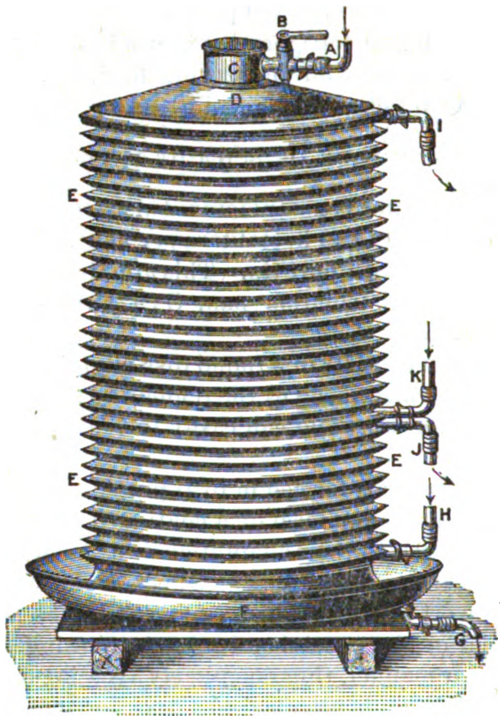
The distribution pan consists of a round disk slightly curved, supplied with a central basin which receives the regulating stopple. This basin serves to distribute the wort and can easily be removed from the apparatus.

The undulated cylinder is formed of oval pipes, which are soldered in following a curve making the form of a continued screw or spiral; the form of the pipes, as well as their adaptation, is calculated with the view of obtaining the greatest possible cooling effect, so that the surface to be gone over by the wort be as long as possible and the flowing not too rapid. By means of the receiving basin the flowing of the wort is obtained in a regular manner, thus completely avoiding foam and splashing. The receiving basin is attached to the cylinder in the apparatus Nos. 1, 2, and 3, but is movable in Nos. 4, 5, and 6, but if desired can also be fixed to the cylinder of the last-mentioned apparatus. The wort to be cooled is brought into the receiving and distributing basin B by the regulating stopple A. It penetrates into the distributing pan C by the openings in the bottom of the receiving basin; it runs from this basin in a regular manner over the cooler D, and reaches the collecting basin K cold, where, by means of stopple E it is conducted into the fermenting vats.

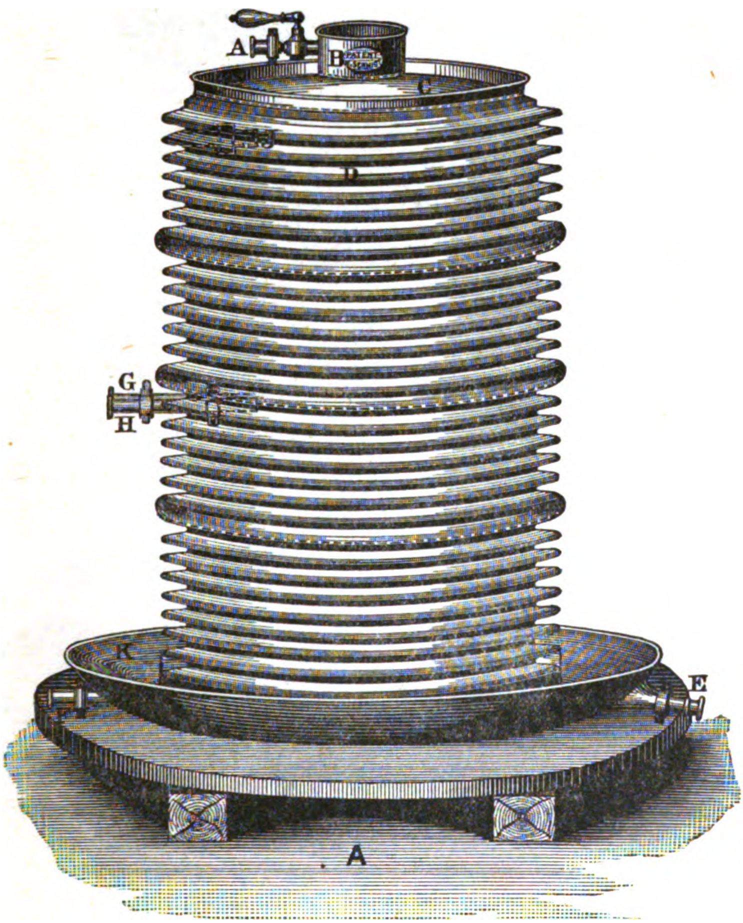
The cold water is conducted into two separate divisions. For the upper division ordinary water is used, for the lower division ice-water is employed. By means of a communication pipe the apparatus can be supplied with either ordinary or ice-water, as may be desired. The ascension of the cold water is obtained by pumps or pressure. The ice-water enters the apparatus by F and circulates through the pipes surrounding the cylinder and flows out by stopple G. Ordinary water circulates likewise in the pipes; it enters by H and flows out by J. The

apparatus reduces the temperature of the beer in an hour from one-half to 1 degree above ice-water temperature. If only ordinary water is used the temperature of the beer is reduced to that of the water.

Model B has two cooling surfaces, external and internal.

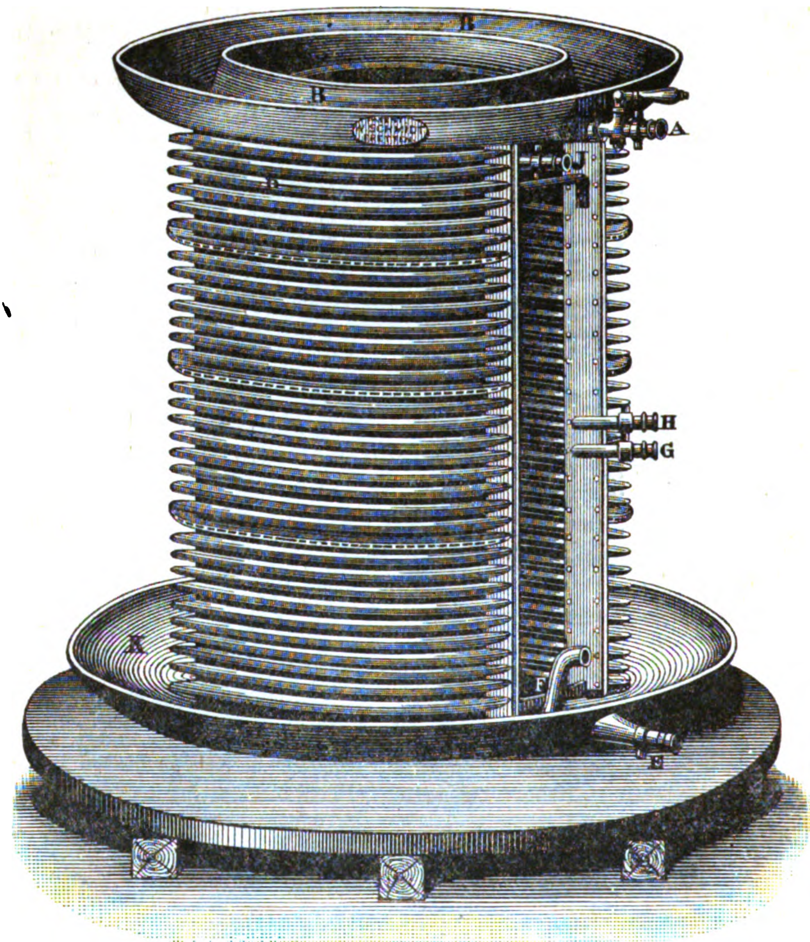


No. 3.—Mennig. (Imitation of the Schmidt patent.)



No. 5.—Model A.

A. Regulating stopple.
B. Basin of reception and distribution.
C. Pan of distribution.
D. Reeded or fluted cylinders.
E. Stopple for drawing off the wort.
F. Ice-water inlet.
G. Ice-water outlet.
H. Ordinary cold-water inlet.
J. Ordinary cold-water outlet.
K. Receiving basin of the cooled wort.



No. 6.—MODEL B.

A. Regulating stopple.
B. Basin of reception and distribution.
D. Reeded or fluted cylinders.
E. Stopple for drawing off the wort.
F. Ice-water inlet.
G. Ice-water outlet.
H. Ordinary cold-water inlet.
J. Ordinary cold-water outlet.
K. Receiving basin of the cooled wort.

This apparatus can cool from 50 to 120 hectoliters per hour.

PRICE AND DIMENSIONS OF MODEL A.

Number.	Full height of apparatus.	Diameter of cooling cylinder.	Number of flutings.	Extent of the cooling surface.	Cooling power per hour.	Price of apparatus.
	Meters.	*Meters.*		*Sq. meters.*	*Hectoliters.*	*Francs.*
1	1.30	.48	27	3.50	7	325.00
2	1.40	.59	28	5.00	10	437.50
3	1.50	.75	28	7.50	15	562.50
4	1.60	.92	29	10.00	20	750.00
5	1.65	1.08	30	12.50	25	937.50
6	1.75	1.27	29	15.50	30	1,125.00
7	1.80	1.41	30	18.00	35	1,312.50
8	1.85	1.55	31	20.50	40	1,475.00

PRICE AND DIMENSIONS OF MODEL B.

9	1.67	1.44	30	33.00	50	1,750.00
10	1.77	1.59	32	39.50	60	2,075.00
11	1.87	1.74	31	46.50	70	2,425.00
12	1.87	1.92	34	52.50	80	2,775.00
13	1.97	2.04	36	59.50	90	3,125.00
14	1.97	2.22	36	65.50	100	3,475.00

GEO. W. ROOSEVELT,
Consul.

UNITED STATES CONSULATE,
Brussels, February 21, 1890.

LIEGE.

REPORT BY CONSUL PRESTON.

Refrigerators are scarcely ever used; I have never seen one here. The weather is never so warm but that the butchers hang their meat in the open air, and in private houses there is no need for them.

Very little ice is used, or is necessary here, except in the restaurants or bakeries where they make ices and ice-cream. Ice has been brought for these purposes for the last two years from Norway, via Ostend, at prices ranging from $2.90, $3.87, to $3.96 per 1,000 kilograms, in car-loads of 10,000 kilograms. There are two manufactories for making artificial ice in Liege. It is now selling at $39.60 for 10,000 kilograms; $5.79 for 1,000 kilograms; $3.96 for 500 kilograms; 96.5 cents for 100 kilograms; 58 cents for 50 kilograms.

I may add that the river never freezes here, therefore all the ice used is artificial or imported.

WM. S. PRESTON,
Consul.

UNITED STATES CONSULATE,
Liege, January 14, 1890.

DENMARK.

REPORT BY CONSUL RYDER OF COPENHAGEN.

Besides the use of ice in the numerous home industries, such as breweries, dairies, slaughter-houses, etc., where the ice is preserved in underground cellars and placed in tanks constructed according to its special use for cooling of large stock rooms and milk rooms, refrigerating boxes are used here in large quantities in all the hospitals, hotels, restaurants, beer saloons, bakeries, butcher, fish, milk, and provision shops, as well as in many private establishments.

The boxes so employed, and which are almost entirely of home manufacture, are of different systems; of which the first consists of two wooden cases, the one contained within the other, the interstices between of 1½–2 inches in width being filled with cork shavings, the doors being quite tight, with one or two air valves to the inside. The interior of the boxes is cased with zinc sheathing and the shelves placed therein are of grating form. From the top plate of the box, a tank, also of zinc sheathing, to contain the ice, extends down the middle of the box or is attached to one side of the cooling-chamber, the ice being placed on a grating in the tank, the lower part of the tank receiving the escaping water. The most of the refrigerators sold here would appear to be of this pattern; but experience has shown that the system is faulty in many respects. The keeping clean of the zinc casing is attended with much trouble, and a deposit of zinc white is found to be left on the sheets; the inside wooden case is also found to be very prone to decay underneath the zinc.

The other system is also constructed of two wooden cases and the interstices are filled with cork waste, but has no inside casing of zinc. The interior of the box is on the other hand painted with a covering of thick clear lac, with which the box is easily kept clean. Furthermore, the tank containing the ice is of galvanized iron plates, the ice being likewise placed upon a grating, the escaping water however here being carried away through a pipe at the back of the box leading to an iron receiver below, the air valves on the doors or the sides of these refrigerators to be kept open when in use.

This latter system is now regarded here as the most suitable and as such is now accepted by and is in use at all the hospitals.

Both of the above-named systems of refrigerators are almost entirely supplied by home manufacturers, only a very small number of a somewhat similar construction to system No. 1 being imported from Germany, but these are considered as being very inferior in design and workmanship to those of home make and have met with no success in the trade.

The dimensions and retail prices calculated in dollars and cents for the two kinds of refrigerators are as follows:

[Outside measurements.]

	Height.	Breadth.	Depth.	Price.
	Inches.	*Inches.*	*Inches.*	
No. 1	29	26	21	$8.57
No. 2	32	31	22	13.40
No. 3	39	29	23	17.42
No. 4	51	26	23	21.44
No. 5	53	33	26	29.48
No. 6	65	31	21	26.80
No. 7	39	42	25	26.80
No. 8	44	46	26	32.16
No. 9	53	55	27	48.24
No. 10	40	45	26½	29.48
No. 11	64	50	27	53.60
No. 12	67	25	27	24.12

Retail prices of boxes are as follows:

[Outside measurements.]

	Height.	Breadth.	Depth.	Price.
	Inches.	*Inches.*	*Inches.*	
No. 1	36	27	24	$12.06
No. 2	......	......	...	18.40
No. 3	48	48	24	17.42
No. 4	41	41	24	21.44
No. 5	54	39	27	26.80
No. 6	74	34	24	32.16
No. 7	54	53	26½	32.16

In both cases a discount varying from 15 to 20 per cent. is given to wholesale dealers.

Ice is usually secured between the months of December and March, and it is kept in ice cellars, as before mentioned.

In the principal towns some companies keep large quantities of ice in stock and retail it for daily use during the summer months, the price ruling generally at about 20 cents per 100 pounds. Even in exceptionally mild winters, like the present, sufficient stocks of ice can almost always be collected during the short intervals of frost to meet all the requirements of the country, ice 3 inches thick being all that is necessary for safe preservation. In years of ice failure, which is, however, of very rare occurrence, the necessary supplies have to be made good by imports from Norway, when an enhanced price of the article will naturally be entailed.

I am not in a position to say whether the above given prices, with the concurrent charges of freight, insurance, customs dues, etc., would allow our manufacturers at home to introduce their own works with prospects of success. If so, the object would doubtless be best attained through the aid of an active and respectable commission agent on the spot, and we have now direct steam communication with the United States, which must always facilitate such enterprises.

HENRY B. RYDER,
Consul.

UNITED STATES CONSULATE,
Copenhagen, April 3, 1890.

FRANCE.

MARSEILLES.

REPORT BY CONSUL TRAIL.

Refrigerators are not used in the Marseilles consular district, in private houses. I found one at the "American Bar," which was English make, imported by the proprietor. They are not for sale in Marseilles, the inhabitants of this city not as yet being educated up to that point where they are regarded a necessity. At the Grand Hotel Louvre et Paix, the best hotel here, probably, with accommodations for one hundred and fifty guests, the method of keeping meat and fish fresh is as follows: An ice-box of stone and cement, 3 feet high, 2 feet in width, and about 7 feet in length, is built onto the wall in the kitchen. The bottom of this box is V-shaped to carry off the melted ice; above this comes the ice in pieces no larger than a man's fist; on the ice is a cloth, and above this the meat is spread. This box consumes 100 pounds of ice per diem, costing from 1 to 1¼ cents per pound, according to the season. Switzerland supplies Marseilles with nearly all the natural ice it consumes.

Butchering is done once a day in winter and twice a day in summer, and families supply themselves with meat that often. The meat is cooked only a few hours after the killing, and, as a consequence, tender meat is an unknown luxury here.

Practically no effort whatever is made to preserve foods and liquids, the dealer furnishing a fresh supply once or twice each day, and the consumer taking only the quantity that he has immediate need of, and that must be used at once.

Ice is also manufactured to some extent, there being quite a business in caraffe frappé.

These are to be found in all the cafés and restaurants.

As to the best manner of introducing refrigerators into this district, I regret to state that there are only two articles of American manufacture successfully introduced here and carried on with success in establishments devoted solely to their exhibition and sale, the Singer sewing-machine and the Waterbury watch. How these companies succeeded when so many others either failed or abandoned the idea of introducing their goods here after corresponding with the consul and securing his services in the interest of their respective enterprises, I am not informed. Business is conducted on such different principles here from what it is in the United States that, in many cases, owing to the ignorance of the peculiarities of trade here on the part of American

merchants, little more than general dissatisfaction has resulted to both the American shipper and the Marseilles consignee as the return for the consul's best efforts for extending his country's foreign trade.

Experience has proved that the better plan is for the manufacturer or exporter to come in person or by his representative. Through the consul he can then meet the merchants, and from his own observation, judgment, and business experience will be able to decide if the field is a good one for his goods and as to the manner of their introduction.

Marseilles is one of the most backward cities in all Europe, slow to take advantage of improvements, as the sanitary condition of the place proves only too well. But with perserveranee and patience a good agent to sell refrigerators, speaking the language and having a knowledge of the business methods, would in a reasonable time open up an active refrigerator market here.

The city has a population of more than 375,000 inhabitants. As the summers are very long and hot and the winters generally very mild, there never being any ice formed in or near the city, some means of preserving meats and liquids would seem so necessary that the advantages of refrigerators once explained their use would soon follow as a necessary consequence.

I will be most happy to do anything in my power to assist the manufacturers in extending their trade to this quarter of the globe.

O. B. TRAIL,
Consul.

UNITED STATES CONSULATE,
Marseilles, February 5, 1890.

LIMOGES.

REPORT BY COMMERCIAL AGENT GRIFFIN.

This subject is one that has never before been considered in this section, and the little information that answers the questions has been obtained with difficulty.

Refrigerators are almost entirely unknown throughout this section of France. The only methods employed to preserve meat, milk, etc., are placing them in cellars, wells, or cool places. As a household article the refrigerator needs to be brought to the notice of the people, and after careful conversation with many, it is thought that such an article might be introduced, the chief difficulty being the lack of ice.

It would be advisable to have the smaller sizes introduced here, as the apartments are usually quite small and room must be economized in the average household. The construction should be such as to require little or no ice; could chemicals be employed in the place of ice it would be a great advantage in introducing the refrigerator.

The sizes that could be possibly introduced are the smaller ones and so constructed as to take the place of a closet or buffet; with a place specially adapted to keep the wine cool, the arrangement should be such that the bottles can lie upon the side. The price should be moderate; but there might some be introduced of fancy wood and ornamental form that would suit the dining-room better than the kitchen or cellar, as the kitchen is always small.

Ice is manufactured, and is very scarce and very dear. I know of no families who employ it as a household article; it is used in the markets to preserve fish, and among a few pâtissiers who make ice-cream, and a few of the better restaurants. The price is from $1 to $3 per 100 pounds.

The best way to introduce refrigerators in this district would be to show their practicability in the markets where there is a great loss occasioned by the spoiling of meats and vegetables, and where it would be easy to demonstrate their utility. I would strongly recommend that only Americans be intrusted with the work of introducing these goods, for it too often happens that superior articles of American manufacture are superseded by inferior foreign goods, simply because of a lack of proper American representation in placing them upon the market.

WALTER T. GRIFFIN,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Limoges, January 16, 1890.

BORDEAUX.

REPORT BY CONSUL KNOWLES.

Refrigerators are comparatively unknown in this part of France, and yet there is perhaps no part of Europe where they could be used to greater advantage. Bordeaux has the reputation of being the "best fed city" in the world, and judging from what I have already seen and tasted I am of the opinion that its fame in this respect is not undeserved.

I find in the mind of many Bordeaux people a doubt or question as to the advantage and general utility of refrigerators. By many is held the idea that the present excellence of all our markets would be decreased by the introduction and use of refrigerators.

The few refrigerators I have been able to find in this city are seemingly very imperfect and open to many great objections. They are badly constructed and are really nothing more than a crude kind of ice-box. Take a large box and line it with zinc and you will have what goes for a refrigerator here. Of the five or six I examined, only one was provided with a lid or cover. The dimensions are about 7 feet long, 3½ feet wide by 3 feet in depth. There is no separate compartment for the ice, and

this defective arrangement is evidently the cause of the meats placed in the boxes becoming wet and soggy, a condition that annoys the butcher and which is the principal objection on the part of the marketmen to the system of artificial preservation of meats.

From the appearance of the boxes I should say they are "home-made," yet I have been informed that they are manufactured and sold by a firm in Paris, which has, so far as I can learn, the monopoly of manufacturing refrigerators (?) for the European trade.

There are several artificial ice manufactories in this city, and excepting the small amount of natural ice imported from Norway, the demand is supplied by them. The average price of ice in this city is about 75 cents per 100 pounds.

I am convinced that the non-use of refrigerators in this district is due more to a lack of acquaintance with the system of artificial preservation than to any existing prejudice against it. I am positive that the general use of the American refrigerators in this city would result in economizing living expenses and would ultimately reduce the price of food products. This happy advantage and benefit need only to be demonstrated, for then it would at once surmount any and all objections urged against the system, and the refrigerator that refrigerates would speedily become not only a necessity but a blessing to every home.

There is but one successful way to introduce the American refrigerators here, and that is to place a few of them with some of our reliable people, and let them be thoroughly tried and tested. If they are productive of good results the indorsements and testimonials would give them a recommendation and standing in the market here that they would not otherwise have and without which it would be very difficult if not impossible to sell at a profit. The French will not buy a new thing before they try it. They demand first a trial and if it proves satisfactory the article is purchased, but this, however, is a condition of purchase the fairness of which too few American firms recognize.

HORACE G. KNOWLES,
Consul.

UNITED STATES CONSULATE,
Bordeaux, March 6, 1890.

LYONS.

REPORT BY CONSUL FAIRFIELD.

Refrigerators are used somewhat, but by no means as extensively as in the Northern States of our own country. As far as I have been able to find out, their use here is almost entirely confined to those keeping restaurants and to butchers.

It is the general habit of the people here to buy only what they want for the day, and at night nothing remains to be kept over.

It has seemed to me, however, that if the conveniences of a first-class refrigerator were better understood they would be much more in demand, especially if they could be furnished at a lower price than that at which they are now sold.

My impression is that it would soon be as it is now with American base-burners, which this winter are for sale everywhere, so thoroughly have they proved themselves to be a convenience and an economy.

There are no peculiar features required in the construction of refrigerators for this district. Judging from my six months' experience in housekeeping here, I think that the refrigerator which we used in our Michigan home would meet our needs as fully here as there.

The refrigerators in use in this district are manufactured in Lyons; but yet I presume that they are probably made in two or three other of the larger towns. There are three establishments in this city where they are made, but in no large quantity. They are not kept in stock, as with us in America, but each one is made to order.

The sizes are various, and somewhat irregular, each, as before stated, being made to order. The formation is decidedly inferior to those that are made with us, and less convenient in arrangement. The prices are much higher, growing out of the fact, I think, that those who make them make but few, comparatively. The establishment in this city which does the largest business sells less than one hundred a year. A small refrigerator, about a yard wide, 40 inches high, and 20 inches deep, sells at $14. I found one 8 feet high, 7 feet wide, 2½ feet deep, for which the purchaser paid $75.

Some of the ice is manufactured artificially, but more of it is brought from the Jura Mountains. It sells in Lyons at 37½ cents per 100 pounds, or 80 cents 100 kilograms.

I am also requested to report upon the best manner of introducing the American refrigerators into this district.

This is a mere matter of "business judgment."

At present refrigerators are not kept in stock by any class of merchants or manufacturers.

I think if a few dozen refrigerators of assorted sizes were put into the hands of some of the more enterprising merchants, who would have them on hand, advertise them, and exhibit them, in the same way in which American base-burners have been brought to the attention of the people of this city, that they would soon come to be regarded as a necessary article of furniture, that no well-regulated family could do without. It would not then be a necessity, as it is now, that a housekeeper should buy simply for the day.

ED'D B. FAIRFIELD,
Consul.

UNITED STATES CONSULATE,
Lyons, February 25, 1890.

NICE.

REPORT BY CONSUL BRADLEY.

Referring to circular of November 25, regarding use and introduction of refrigerators in my district I beg to offer the following answers to the questions:

Very few used. None for sale.

No peculiar features required.

Manufactured by the carpenters.

Ice is brought from the mountains near Nice and sells for 5 cents per kilo ($2\frac{1}{5}$ pounds).

The resident population are very conservative—not inclined to adopt new ideas which must be paid for.

They use no iced drinks. During the winter food which is bought in small quantities is readily preserved without ice. In summer perishable food is distributed several times each day. Meat enough for the day is butchered in the morning of each day.

A number of moderate-priced refrigerators placed where they could be seen in operation would be the best means of introducing them to the people.

WM. HARRISON BRADLEY,
Consul.

UNITED STATES CONSULATE,
Nice, January 7, 1890.

NORMANDY.

REPORT BY CONSUL WILLIAMS OF ROUEN.

The request for information on the subject of refrigerators arrived at a very inopportune moment. The influenza which generally pervaded this region left its victims in no humor to discuss the merits of refrigerators, for which articles they have very little interest, as they have existed for ages without them and seem inclined to spend their money for some more ornamental piece of furniture. The climate, mode of living, and habits of the Normans do not incline them to the use of ice.

The heat is not intense, and a cellar for storage of wine or cider is attached to every domicile. The fresh sea breezes of the northern and western coast render ice useless in these ports.

The people are accustomed to buy their supplies for daily use, and their purchases of fish, flesh, fowls, and vegetables and fruits are gauged so closely to their daily necessities that a refrigerator would be considered an incumbrance in their small apartments. They consider ice as detrimental to their beverages, of which water usually forms a small constituent.

Ice is used principally at the sea ports of this consulate for packing fresh fish for transportation to Paris and other inland cities, and breweries and distillers, who, however, resort to other means for cooling. They use a number of refrigerating machines which are manufactured by Lawrence & Co. at London and at Lille and resemble very closely the De La Vergne manufactured at New York. Replying to the interrogatories:

In Boulogne-sur-Mer there are few, if any, in use. The same may be said to apply to Lille, Dunkirk, Roubaix, Dieppe, and Amiens. At one restaurant at Rouen a refrigerator was formed in the construction of the building; the most diligent research could not unearth another.

In the city of Calais only two were discoverable, one at the lunch counter of the railway station (seldom employed), the other in possession of the consular agent of the United States at his country residence, used for preserving meat and fish.

Refrigerators adapted to the use of restaurants and country residences would be most apt to meet with sales and must be of the cheapest order.

Both of those at Calais were manufactured by Kent, the English manufacturer.

ICE.

It is brought chiefly from Sweden and Norway. At Rouen the quantity imported varies from 900 to 1,200 tons; price per 100 pounds varies from 5 francs to 10 francs, according to season and quantity. At Dunkirk it costs about 40 francs per 1,000 kilograms (a gross ton) and sells at 4 francs to 6 francs per hundred-weight. At Dieppe in 1888, 189 tons were brought from Norway. In 1889, 1,838 tons were imported, all used for packing fish. At Boulogne-sur-Mer an ice-factory can produce more than enough to supply the wants of the population; there were imported, however, 634,800 pounds of ice in 1889, some of which was forwarded to other destinations and the rest used in preserving fresh fish to supply the markets of Paris and other inland towns. Very little ice is sold by the small quantity, but generally by the ton at from 25 francs to 30 francs for both the manufactured and imported.

Ice-dealers in the cities of Lille, Amiens, Boulogne-sur-Mer, Roubaix, Rouen, and other large towns would be more apt and better fitted to urge sales of refrigerators. The ice-dealer and the leading confectioner of this city state that they believe fifty refrigerators could be placed at Rouen, and if supplied with circulars and price-lists I would place them in the hands of such persons, believing thereby that I could best carry out the desire of the Department to assist the manufacturers of refrigerators in their efforts to effect sales in this consular district.

CHARLES P. WILLIAMS,
Consul.

UNITED STATES CONSULATE,
Rouen, March 10, 1890.

PARIS.

REPORT BY CONSUL-GENERAL RATHBONE.

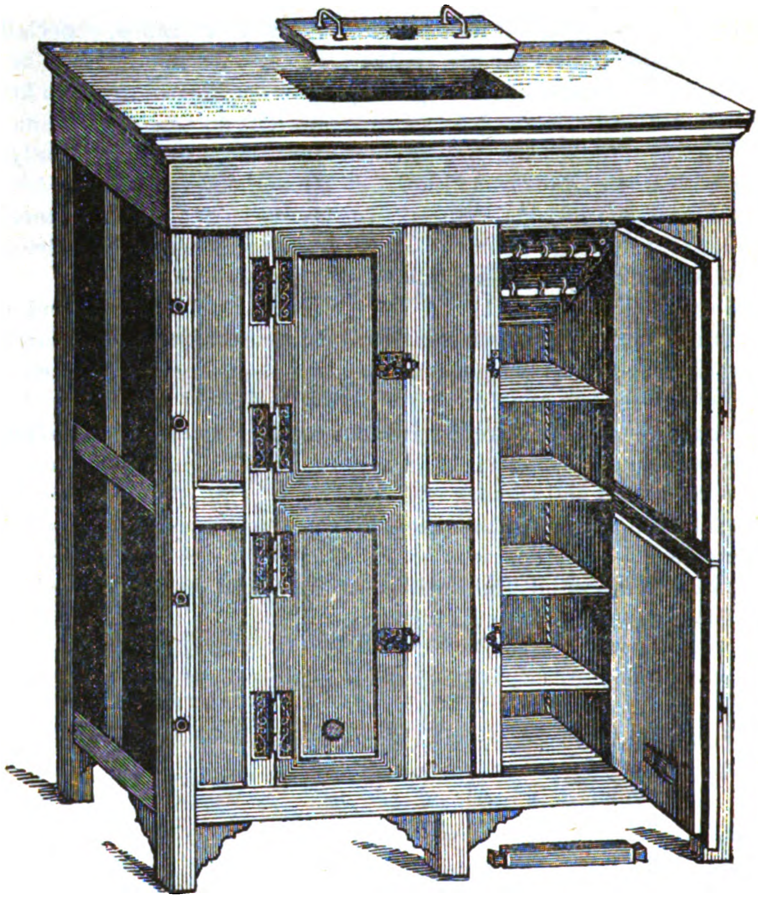
Refrigerators are much less extensively used in France, especially in private houses, than they are in the United States. Summer heat is not so great in France, and French people are not obliged to keep a large store of provisions, having every facility to buy them when necessary, at any time, from provision dealers. These are generally provided with refrigerators, as are also coffee and eating houses, which are very numerous in Paris. Special refrigerators for cooling wines and liquors are, to a large extent, used in most of the Paris public drinking-houses, which number about 30,000.

The only difference between refrigerators used in Paris and those used in the United States is that some have a receptacle for water and that their dimensions are generally smaller, as there is not much room in French houses or apartments to locate them.

The greater number of refrigerators used in France are manufactured in this country, especially in Paris, and most of them are manufactured by the firms that sell them.

The following drawings represent refrigerators constructed by Messrs. Williams & Co., of Paris, who obtained the first prize on their account at the Paris Universal Exhibitions of 1878 and 1882. Their several dimensions and prices are also given:

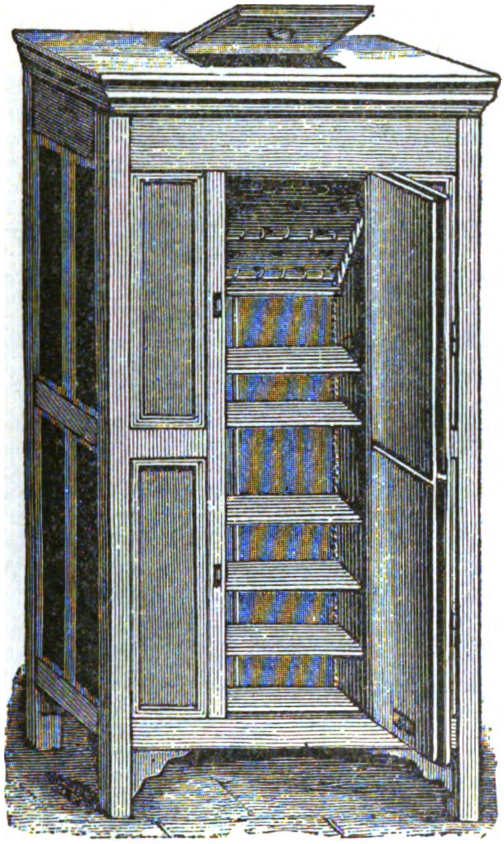
No. 1.—Refrigerators of Large Dimensions for the use of Hotels, Restaurants, Butchers Poulterers, etc.



Exterior dimensions.				
Height.	Width.	Depth.	No. of doors.	Prices.
Inches.	*Inches.*	*Inches.*		
82.7	49.2	27.6	2	$91.68
84.6	59.0	27.6	4	115.80
88.6	78.7	27.6	4	154.40

Thickness of sides, 3.9 inches.

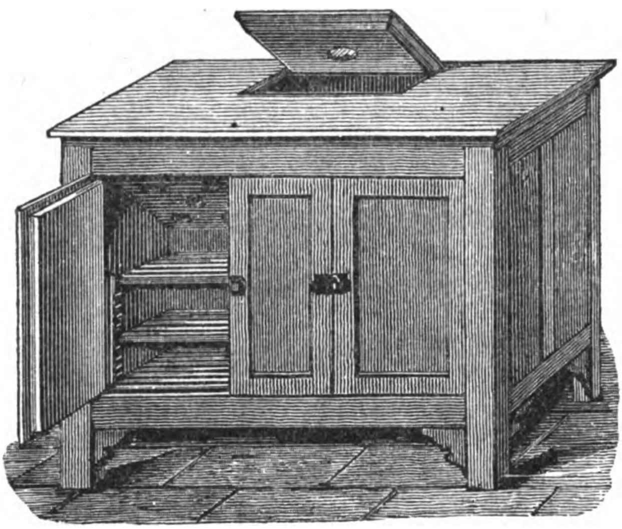
No. 2.—Refrigerators of Ordinary Dimensions for Hotels, Restaurants, Butchers, Poulterers, Private Houses, etc.



Height.	Width.	Depth.	Prices.
Inches.	*Inches.*	*Inches.*	
88.6	39.4	29.5	$77.20
78.7	39.4	24.0	67.55
76.8	30.3	24.0	53.08
59.0	27.6	21.7	42.46

Thickness of sides, 3 inches.

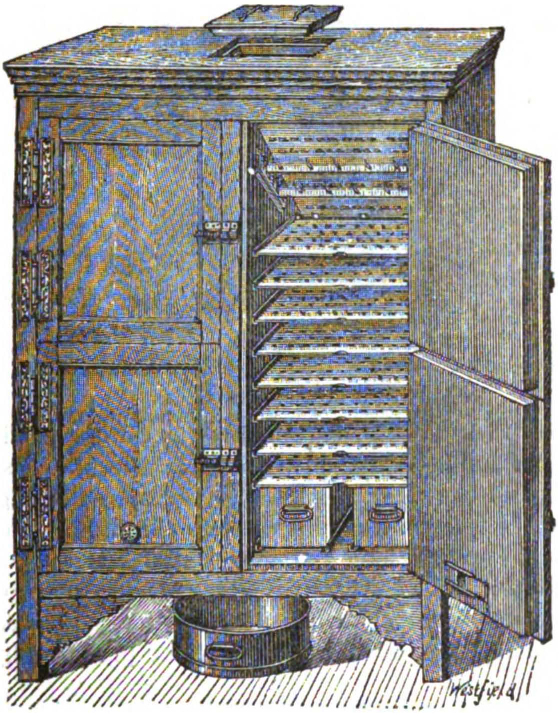
No. 3.—Refrigerators specially used by Pork Butchers and Poulterers.



Height.	Width.	Depth.	Prices.
Inches.	*Inches.*	*Inches.*	
37.4	39.4	25.6	$46.32
39.4	49.2	27 6	53.08

Thickness of sides, 3 inches.

No. 4.—REFRIGERATORS FOR THE SPECIAL USE OF PASTRY COOKS.



[Model with four doors and two distinct compartments.]

Description.	Height.	Width.	Depth.	Price.
	Inches.	*Inches.*	*Inches*	
Decorated pine wood	70.9	43.8	23.6	$111.00
Varnished oak	70.9	43.8	23.6	125.45

[Model with two doors.]

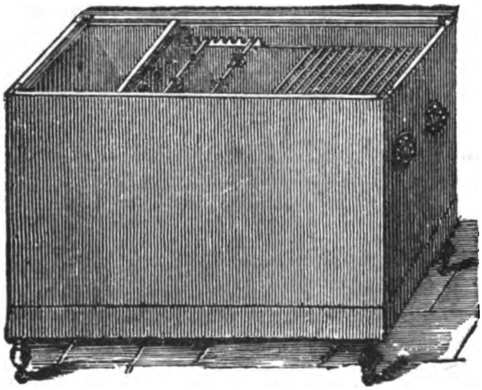
Description.	Height.	Width.	Depth.	Price.
	Inches.	*Inches.*	*Inches.*	
Decorated pine wood	70.9	25.6	23.6	$57.90
Painted oak	70.9	25.6	23.6	67.55

No. 5.—Refrigerators for the use of Families.

Height, 39.4 inches; width, 23.6 inches; depth, 18.5 inches; thickness of sides, 23.6 inches; price, $26.

At the top of these above-mentioned refrigerators there is an opening under which ice is suspended in a basket. The air passing through meets the ice, and becoming much cooler and more dense goes down to the bottom of the refrigerator and escapes through an under opening, bringing out the exhalations and gases produced by the provisions stored in the interior. The warm air which penetrates into the refrigerator when the doors are open has its humidity condensed by the ice, and that humidity runs down with the water produced by the melted ice.

No. 6.—Refrigerator.

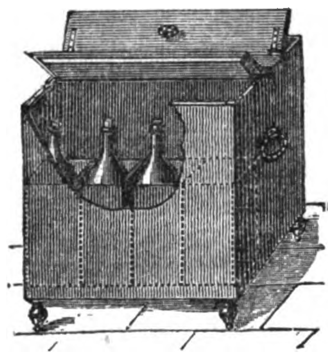


[New model.]

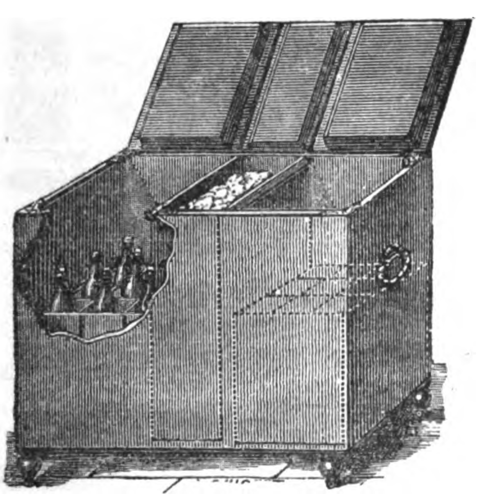
	Width.	Depth.	Height.	Price.
	Inches.	*Inches.*	*Inches.*	
No. 1	21.7	19.7	26.4	$14.50
No. 2	27.6	21.8	27.2	19.30
No. 3	33.5	22.0	28.0	24.10
No. 4	39.4	22.8	28.7	28.95
No. 5	45.3	24.0	29.6	33.80
No. 6	51.2	25.2	30.3	38.60

These refrigerators contain a support furnished with hooks to hang up provisions. In the Models Nos. 1 and 2 there are two movable gratings, and three, four, five, or six of them in Nos. 3, 4, 5, and 6.

NOS. 7 AND 8.—REFRIGERATORS FOR LIQUIDS.

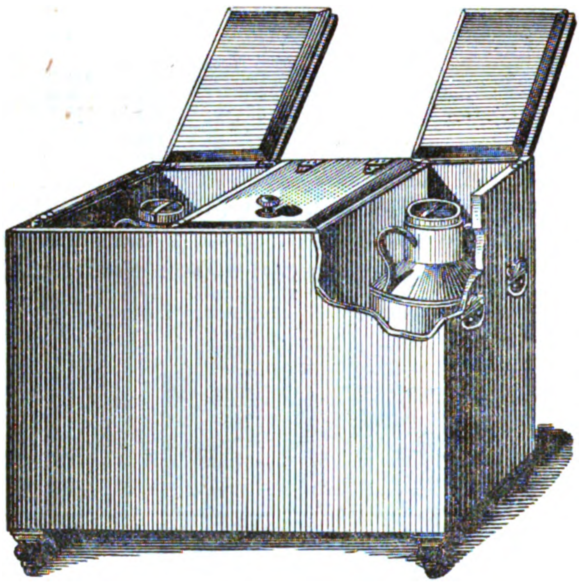


Length.	Width.	Height.	Capacity.	Price.
Inches.	*Inches.*	*Inches.*	*Bottles.*	
27.6	20.5	34.6	16	$19.30
30.7	16.5	34.6	18	23.15
47.2	16.5	34.6	21	29.00
53.9	20.5	34.	40	33.80



Height, 34.6 inches; length, 21.9 inches; width, 21.9 inches; price, $19.30. The ice is placed in the middle compartment.

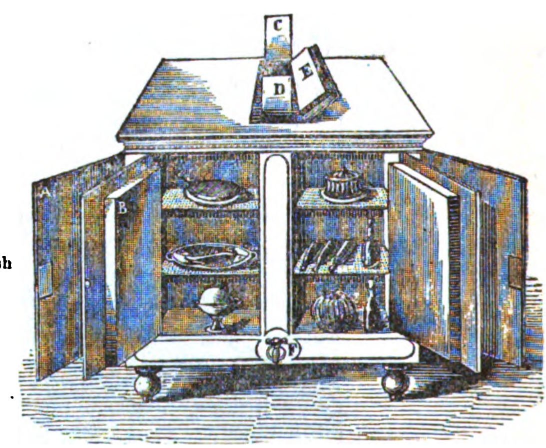
No. 9.—Refrigerator for Milk and Cream.



Price, $34.75.

No. 10.—Refrigerator for Cafés, Restaurants, and Dining Rooms.

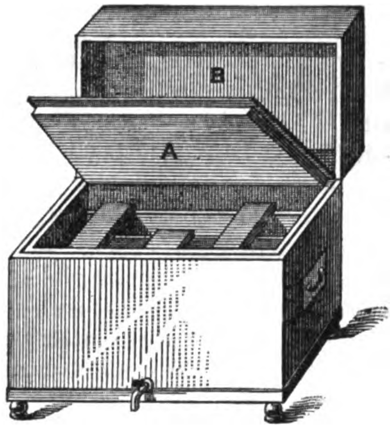
A. Exterior door.
B. Interior door.
C. Opening for the water.
D. Opening for the ice.
E. Marble cover.
F. Cock for the drawing of fresh water.



Depth, 39.4 inches; width, 20.1 inches; height, 37.8 inches; price, $72.40. (The top of the refrigerator is made of white marble.)

No. 11.—Refrigerator for Restaurants, Cafés, Hotels, Pastry Cooks, and Confectioners, Butchers, and Poulterers.

Number.	Length.	Price.
	Inches.	
No. 0	17.7	$13.50
No. 1	23.6	21.23
No. 2	27.6	25.10
No. 3	31.5	28.95
No. 4	35.4	33.78
No. 5	39.4	40.63
No. 6	43.3	50.20



These refrigerators are made like ordinary ice-boxes, lined inside with zinc, with a space of about 2½ inches between the wood and the lining, which is filled with a preparation of coke and sawdust; the ice is plac. d on the bottom and on the shelves above.

There are three kinds of ice used in France: First. Natural ice, secured when possible in winter time from lakes and rivers. This ice is from 4 to 6 inches thick, and sells for 65 cents per 100 pounds. Second. Mountain ice, from Switzerland. This ice is very pure and clear and from 10 to 20 inches thick, and sells for 75 cents per 100 pounds. Third. Artificial ice, which is the most in use in France, and is made from filtered water congelated by mechanical process into blocks 6 to 10 inches thick and 4 to 5 feet in length; it is a very good ice, but does not last so long as the natural ice. The price is about 45 cents per 100 pounds.

As to the best manner of introducing refrigerators in my district, I should suggest that catalogues and price lists be sent to the following firms: Messrs. Plassard, Morin, Fillot & Cie. (Bon Marché), Rue du Bal; Messr. Directeur des Magasins du Louvre, Rue de Rivoli; Messrs. Jaluzot & Cie. (Au Printemps), Boulevard Haussman; Messrs. Druge (ménagère), 20 Boulevard Bonne Nouvelle; Messrs. Venière frères (special furnishers for drinking-houses), 2 Boulevard Richard Lenoir.

The duty on refrigerators is $1.22 per 100 pounds.

J. L. Rathbone,
Consul-General.

United States Consulate-General,
Paris, February 12, 1890.

ST. ETIENNE.

REPORT BY COMMERCIAL AGENT MALMROS.

In the town of St. Etienne (140,000 inhabitants) about one hundred refrigerators are used. From inquiries made in the towns of Roanne, 20,000, Grenoble, 45,000, Firminy, 15,000, Montbrison, 6,000, Millau, 14,000, and Le Puy, 20,000 inhabitants, the proportion of refrigerators to the number of inhabitants in each town is almost the same as in St. Etienne. In the farming districts more are used. Nearly all of the refrigerators used are by butchers, hotels, restaurants, and places where beer is sold by the glass. In St. Etienne, after much research, I have been able to hear of only four private families using refrigerators, and all of these had repeatedly and for longer periods of time sojourned in Paris, where they had become accustomed to the use of them. Refrigerators may, of course, be found in one or two families unknown to me, but I do not believe this to be the case. With the exception of thirteen, all the refrigerators used here in St. Etienne are common wooden ice-boxes, with double walls filled with sawdust, occasionally zinc lined with a hole in the bottom to let the melted ice run off. These boxes are made either by men servants employed in the houes or by carpenters. The thirteen refrigerators before mentioned as exceptions are patented by the French Government and manufactured and bought in Lyons. The most expensive of these thirteen is about 8½ feet high, 6 feet wide, and 4 feet deep, made of hard wood and the four walls lined inside with white marble slabs. In the center it has a hollow vertical partition wall, zinc lined, which at a point about two-thirds of its height is furnished on each side with six venetian blind-like slits. The top of this refrigerator can be raised and the partition wall is filled with ice from above. The front wall is divided lengthwise into halves, each of which hangs on hinges and serve as doors. The space on each side of the partition wall is again divided once by a horizontal wall. The upper compartments so produced are closed only by the two general outside doors while the two lower compartments are each, besides, provided with a separate thick inside door. This refrigerator costs 550 francs and gives satisfaction to its owner. The other twelve refrigerators are made by another manufacturer and under another patent, but none of these twelve are constructed under a different plan from the other eleven, and vary but little even as to size.

The ordinary size of these refrigerators is 7 feet high, 4 feet wide, and 26 inches deep. They are made of wood, zinc lined, and the interior constitutes but one compartment, furnished with movable shelves, and hooks on the upper portion of the walls to hang meat upon. The ice chamber, about a foot high, is immediately under the top lid, the latter constituting the upper covering of this chamber, which is drained by a zinc pipe, of about one-half inch in diameter, running down one of the in-

side walls of the refrigerator. These refrigerators are considered by those who use them as considerably superior to the one first described. The size mentioned is sold at 400 francs; smaller sizes are sold at 350 francs. None of the thirteen refrigerators are used by others than butchers. No refrigerators are manufactured within the limits of this consular district except the common home-made ice-boxes before referred to.

So far as is apparent from the foregoing statement, there is hardly any market in this district for refrigerators. Whether a market for them may be created depends to the greater extent upon the circumstance whether private families can be induced to use them. Hitherto these have been quite content with the comparative coolness of their cellars for the preservation of their food. It must be remembered also that the French people are a very conservative one in regard to their habits, and especially in regard to everything concerning their food. Notwithstanding this, however, as the advantages of having refrigerators are great, and as they are already much used in Paris, the example of which city the provinces are greatly inclined to follow, I believe that a considerable demand for them may be developed. But this will require much time and work, and the growth of the trade will at best not be rapid unless refrigerators can be placed in the market at prices lower than the current ones. The best way to introduce the article will be to expose it for sale in the principal towns of the district, which at present is not done by any firm; to advertise in the local newspapers, and to intrust the sale to persons who will take an active interest in pushing its sale.

No peculiar features are likely to be required in the construction of refrigerators for this district.

Full price lists will no doubt be forwarded by consuls in France in whose districts refrigerators are manufactured. In case the Department should desire it I can, however, procure them.

Ice is secured by farmers, who overflow their meadows in winter with water from the springs and brooks in which this region abounds. The ice is cut when from 4 to 5 inches thick and from four to five times during the season. The farmers sell ice delivered at St. Etienne at an average price of 5 cents per 100 pounds.

OSCAR MALMROS,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
St. Etienne, February 18, 1890.

GERMANY.

AIX-LA-CHAPELLE.

REPORT BY CONSUL PARSONS.

Refrigerators are used in this consular district by keepers of hotels and restaurants, by butchers and fish merchants, by vegetable and fruit dealers, and others who handle perishable goods; also in private families of the wealthier classes.

The following price list of Robert Schreiber & Co., the only important refrigerator-manufacturers in this district, will serve to show the sizes, formation, and prices of the refrigerators of a modern type in use here. The factory of Robert Schreiber & Co. is situated at Nos. 120–122 Adalbertstrasse, Aix-la-Chapelle.

PRICE LIST AND DESCRIPTIONS.

Refrigerators of solid, tasteful form, in fine polished oak. The sides of the ice-box are provided with lattices, through which the ice cools the refrigerator directly, preventing almost entirely the gathering of sweat-water, and securing a very low temperature. The ice-box is in this way better calculated to resist the pressure of the ice from within. For convenience in cleaning, the ice-box can be taken out. Upon the outer side of the refrigerator is a nickled faucet to carry off the ice-water.

	Doors.	Gratings.	Height.	Breadth.	Depth.	Weight.	Price.
			Centimeters.	*Centimeters.*	*Centimeters.*	*Kilograms.*	*Marks.*
No. 1	1	1	74	61	49	40	33
No. 2	1	1	80	77	58	62	44
No. 3	1	2	86	80	60	70	55
No. 4	1	2	103	82	64	83	66
No. 5	2	2	80	106	60	82	77
No. 6	2	4	86	108	62	90	95
No. 7	2	4	103	120	65	140	105
No. 8	2	6	121	123	67	175	120
No. 9	2	8	150	132	70	215	165
No. 10	2	8	173	143	76	285	195
No. 11	2	8	189	187	88	415	280
No. 12	2	10	200	200	88	520	420

7a. One door with 2 gratings upon the right side, the ice-box occupying the left side. Fish can be placed directly upon or between the ice. Practical for fish, vegetable-dealers, etc.

103 cm. height; 120 cm. breadth; 65 cm depth; 150 kilos.

Nos. 10, 11, and 12 have three bolts by means of which the door is tightly closed above, below, and in the middle.

Beer refrigerators, with and without place for articles of food, are delivered in every size and form; also refrigerators for *restaurateurs*, etc.

Refrigerators of fine polished oak, specially adapted for butchers, three gratings upon the left side and one upon the right side. On both sides, above, heavy rods with meat hooks, and on the right side of the ice-box, rods with smaller hooks for smaller pieces of meat.

	Doors.	Gratings.	Height.	Breadth.	Depth.	Weight.	Price.
			Centimeters.	*Centimeters.*	*Centimeters.*	*Kilograms.*	*Marks.*
No. 9	2	4	150	132	70	215	165
No. 10	2	4	173	143	76	285	195
No. 11	2	4	189	187	88	415	280
No. 12	2	4	200	200	88	520	420

Refrigerators in solid form, which may be conveniently taken apart. On the left, two large gratings; above, on both sides, heavy rods provided partly with ordinary meat-hooks and partly with movable hooks. On the right side of the ice-box, rods with small hooks. In these refrigerators there is room for the largest pieces of meat. The dimensions are those of the body of refrigerators, not actual measurements as above, inasmuch as a cornice 11 centimeters wide projects on both sides and in front and this cornice is not included in the given dimensions. The entire form and finish of this refrigerator are ornamental.

	Doors.	Height.	Breadth.	Depth.	Weight.	Price.
		Centimeters.	*Centimeters.*	*Centimeters.*	*Kilograms.*	*Marks.*
No. 13.............	2	230	200	100	850	500
No. 14.............	2	230	220	120	1,000	600

Refrigerators Nos. 10–14 are provided with bolts, by means of which the door is tightly closed above, below, and in the middle.

We deliver on command all refrigerators with ice-box above, provided with a new patent drop-contrivance, by which, through lattices, the cooling process follows directly, preventing the gathering and falling of sweat-water, which in the case of ice-boxes above, tightly closed, takes place to a great extent.

The prices of these refrigerators, in accordance with size, is greater by 3-20 marks.

It will be seen from this report that the refrigerator industry in this district is still in its infancy. I have spoken with several well informed men touching the matter. All had seen our American refrigerators and thought them much superior to the German in form and construction. In general, however, these American refrigerators are not known here and can only be introduced through judicious advertising, either through the press indirectly or directly through representatives of American houses. All are ready to admit the superiority of many American manufactures, and yet all have the idea that these articles are much more expensive than those of home production. Lack of definiteness in advertising is largely responsible for the misunderstanding which prevails so extensively in this respect.

It is the fact that in this district, except in wealthy families and large hotels and markets, refrigerators are generally of the most primitive form. Even in large hotels I have found ice-boxes consisting simply of a wooden box lined with zinc. This is the form of refrigerator usually found in shops of small dealers in perishable goods.

Up to within a few years ago very little attention was paid to the form or construction of refrigerators. Every carpenter and tinman was considered qualified to manufacture them, and even to-day most of the ice-boxes are ordered in this way.

Ice for the most part is manufactured in this district, the ratio between natural and artificial ice varying of course with the severeness of the winter. There are three ice factories in Aix-la-Chapelle, and ice can also be obtained from some of the largest breweries and also from dealers in natural ice. It is seldom, however, that natural ice attains a thickness of 6 inches here at Aix-la-Chapelle. It is often harvested when but 2 inches thick. Lack of means of transportation prevents the importation of natural ice from the mountainous portions of the district.

The price of ice varies greatly, as in America, from 50 pfennige to 3 marks per 100 pounds. Prices depend, as with us, upon contracts, upon quantity bought, upon season of the year, upon winter, whether mild or cold.

JAMES RUSSELL PARSONS, JR.,
Consul.

UNITED STATES CONSULATE,
Aix-la-Chapelle, February 1, 1890.

ANNABERG.

REPORT BY CONSUL HUBBARD.

The consular district of Annaberg, by reason of its elevation and latitude, is practically one immense refrigerator during almost the entire year. Lying wholly in the Ertzgebirge or Ore Mountains, on the northern border of Bohemia, at an average elevation of 2,000 feet, and in the same latitude as Labrador, in British America, the inhabitants rarely, if ever, experience an uncomfortably warm day, and *never* an uncomfortably warm night. On this great plateau, extending from the Elbe to Voigtland and embracing some of the wildest scenery in Europe, there are no natural ponds and the mountain streams are exceedingly variable, with steep and rocky beds, sometimes filled with wild, roaring torrents and again as dry and dusty as the highway in summer.

Ice is only obtained here from artificial ponds, but fortunately, and in obedience to the law of compensation, the demand for it is very limited and it is regarded as an article of luxury, not of necessity.

As before remarked the elevation and latitude are quite sufficient to insure refrigeration of both liquids and solids.

Other means than the use of ice, however, are sometimes employed here to secure the preservation of food in a condition which will not be prejudicial to the health of the inhabitants. It is a well known fact that no article of diet suffers so quickly by exposure to heat as fish, but artificial refrigeration is not required for the preservation of fish in the Ertzgebirge, as the sale of dead fresh fish is here forbidden by law. It was to me a most interesting sight to be shown the other day an enor-

mous carp swimming contentedly about in a tub in my own kitchen. I had ordered fish for dinner the next day and the *Dienstmädchen* wished me to examine this sample, or *Muster*, as she called it and inform her whether it was satisfactory or not. The servant lifted the scaly visitor out of the water, opened and carefully examined its mouth, scrutinized its fins and scales, and explained to me that all appearances indicated the fish was in a normal state of health and entirely fit for a consul's table; to all of which this dull, phlegmatic carp submitted with the most touching resignation. It was pronounced in every respect satisfactory and again returned to its native element in the tub.

I will also remark that, with regard to hares, partridges, pheasants, and similar game, it is quite a common custom to hang them out of an attic window for three or four weeks, for the purpose it is said, of improving the flavor and it is claimed that exposure to the pure, dry, mountain air, always rich in ozone, is better than placing them in a close refrigerator.

From the foregoing statement of climatological facts it is readily seen that a good cellar in the Ertzgebirge fully meets the exigencies of the people in the preservation of food and drink and that this consular district does not offer a very brilliant prospect for the introduction and sale of American refrigerators.

I will now answer, categorically the questions proposed by the Department.

Refrigerators are used in this consular district to a limited extent, but their use is generally confined to the wealthy residents of cities.

Refrigerators which I have examined in Annaberg do not differ materially from, and are equal in all respects to, those which I have seen and used in America.

No refrigerators are manufactured in this district. I am informed that those used here are all made in Dresden.

The following tabulated statement of sizes and prices is taken from a price-list given me by Mr. G. Kirchhof, jr., a merchant of the city of Annaberg and sole agent for refrigerators in this district, so far as I know.

Height.	Width.	Depth.	Price.	Height.	Width.	Depth.	Price.
Inches.	*Inches.*	*Inches.*		*Inches.*	*Inches.*	*Inches.*	
31½	26	21	$7.25	44	34½	28	$15.50
34	32	25½	8.50	30½	46	26½	18.00
36½	33½	27	10.50	44	52	28	19.00
21½	40	21	10.00	64	56½	29½	34.00
34	32	25½	11.00	89	80	38	70.50
34	46	25½	13.50	93	93	40	100.00

Ice is secured in this district from small artificial ponds, and is delivered for about 20 cents per 100 pounds. The demand for it is very limited.

I would advise any American manufacturer, who desires to introduce his refrigerators into this district, to communicate with Mr. G. Kirchhof, jr., of Annaberg, a merchant of the highest honor and integrity.

I will add that the German Government imposes an import duty of about $1 per 100 pounds weight on refrigerators.

DANIEL B. HUBBARD,
Consul.

UNITED STATES CONSULATE,
Annaberg, January 28, 1890.

BERLIN.

REPORT BY CONSUL-GENERAL EDWARDS.

I have the honor to report that upon the receipt of the refrigerator circular of November 25 last, I addressed thirty-two separate inquiries to the manufacturers of and dealers in refrigerators in Berlin with regard to their prices, etc.

The sizes, formations, and prices of the refrigerators in use in this district may be seen from an examination of the price lists which accompany this report.

Ice is secured in the ordinary way from the river here which flows through the city, and is stored as with us in an ice-house built for the purpose. The price of the ice ranges from 50 pfennig to 70 pfennig per centner.

It occasionally happens that on account of an open winter the Berliners are compelled to send to Sweden for their ice, in which case the price is much dearer.

By an examination of the following illustrations the American manufacturers can readily see what chances they have in this market.

W. H. EDWARDS,
Consul-General.

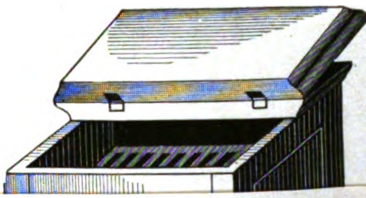
UNITED STATES CONSULATE-GENERAL,
Berlin.

CHEMNITZ.

REPORT BY CONSUL MERRITT.

Refrigerators are used quite extensively in this consular district, being found in all restaurants, saloons, meat-shops, etc., and in the houses of most well-to-do private families.

Refrigerators are built here on the same principles and in the same style as in the United States, there being a number of manufacturing establishments engaged exclusively in this line.



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In size the refrigerators here used run all the way from the large ones used by butchers and restaurant keepers down to the small boxes used in private families for keeping small quantities of butter, milk, etc., fresh.

As in the United States refrigerators are here made of various kinds of wood, are usually finished in oil, and are lined with plate zinc.

The prices may be stated as follows:

Weight.	Height.	Width.	Depth.	Doors.	Compartments.	Price.	
						In oil.	Varnished.
Pounds.	*Inches.*	*Inches.*	*Inches.*				
80	28	30	24	1	2	$8.50	$9.25
90	36	30	24	1	2	11.50	12.50
125	44	30	24	1	4	15.50	16.75
160	52	30	24	2	4	20.25	21.50
185	44	44	24	2	6	23.75	25.75
210	60	46	24	2	8	28.50	31.00

The above prices are for retail with 4 per cent. off for cash. They are also sold on the installment plan on easy terms, at about the rates given above. The prices on larger sizes are proportionately greater.

For medicinal purposes artificial ice is used, and is sold all the year round at 1.30 marks per 100 pounds (German) equal to about 27 cents per 100 English pounds. For purposes other than medicinal, natural ice is used. This is very cheap, though only of medium quality, being delivered in winter at 15 to 20 pfennig (3½ to 4¾ cents) per 100 pounds. In the summer the price of ice is higher, but never passes above 50 pfennig, or 12 cents per 100 pounds.

The principal use to which ice is put is to keep beer and meat cold. All breweries furnish the necessary ice to their customers free of charge, and the same rule applies between the large butchers and the retail meat dealers.

For the manufacture of artificial ice, machinery of the most improved and scientific nature is employed. But ice-cutting and harvesting machinery is practically unknown, and ice on rivers and ponds is cut and harvested by hand in the old-fashioned process.

After consideration of the whole subject, I can hardly view the introduction of American refrigerators into this consular district as practicable. Refrigerators are sold here at quite as low prices as in the United States, and the freight on such bulky articles, together with the German import duty (10 marks per 100 kilograms—$1.10 per 100 pounds), would seem to shut out American competition completely.

HENRY F. MERRITT,
Consul.

UNITED STATES CONSULATE,
Chemnitz, March 8, 1890.

COLOGNE.

REPORT BY CONSUL WAMER.

Refrigerators are extensively used in this district, and almost every well-situated family is provided with one.

There are different styles. The oldest and best known refrigerator is constructed in such a manner that the space for the ice is on the side; this is, however, only for the smaller-sized ones. In the larger refrigerators the space for the ice is in the middle. A new style, by some considered the best one, has been patented by Mr. Alex. Heberer, of Mannheim. His refrigerator is constructed in such a manner that the space for the ice is on the top. The inclosed designs, "Refrigerators in general use in Cologne," show the different styles referred to.

Most of the refrigerators used in this district are manufactured in Dresden, Düsseldorf, and Gaggenau in Baden.

Ice is manufactured in all the larger towns in this district. There are three manufactories in this city. The price varies according to quantity ordered. For small amounts the price is 24 cents and for large amounts 17 cents per centner (centner equal to about 100 pounds).

W. D. WAMER,
Consul.

UNITED STATES CONSULATE,
Cologne, February 13, 1890.

CREFELD.

REPORT BY CONSUL BLAKE.

Refrigerators are in general use, not only in private families, but in hotels, wine and "restauration" dining-rooms.

All refrigerators are constructed with the ice reservoir either in the center or on the side of the zinc or porcelain lining, which will be explained more fully in answer to question 4.

Those in use in this district are manufactured in the local towns, and are largely manufactured in the city of Crefeld and shipped to the smaller towns of this district. They are made in all sizes, ranging from 3 to 10 feet square. The material used for the outside is fir wood. The lining is generally zinc, but occasionally porcelain is used about one-half an inch thick and 6 to 8 inches square. The smaller sizes have only one door, and are only in use by private families. The ice reservoir in this size is on the side and extends from the top of the refrigerator to the bottom of the zinc lining, and has a faucet at the bottom for drinking-water. Some have drainage only under the refrigerator. The larger sizes have two doors in front, with ice reservoir in the center, extending also from the top of the refrigerators to

the bottom of the lining, and have faucets at the bottom for drinking-water. The ice reservoir is usually made of zinc, occasionally of porcelain, and made water-tight nearly to the top, and then perforated with holes. All sizes of refrigerators have a dead air space between the wood and zinc or porcelain lining, and have an opening at the top, with a movable zinc-lined cover, through which the ice is put into the reservoir.

Refrigerators in use in meat markets have iron rods inside, near the top, provided with movable iron hooks.

Wine and dining "restaurations" have a peculiar refrigerator, usually made of carved and polished walnut, placed upon the counter in the dining room. This refrigerator is lined with zinc and has a dead-air space of about 2 inches. In the inside of this reservoir there are three or four separate coils of lead-pipe with a faucet attached to each from the outside. Beer and other kinds of liquor are forced through these pipes by means of an air-force pump.

The prices of refrigerators range from $10.47 to $95.20 and upwards, as the following table will show:

	Sizes.	Price.
	Feet.	
One door	3 by 3	$10.47
Do	3½ by 3	12.61
Two doors	4 by 3	18.08
Do	6 by 6	59.97
Do	7 by 8	84.25
Do	7½ by 8	95.20

The refrigerators lined with porcelain and furnished with ice reservoirs cost about 25 per cent more than those lined with zinc.

The weather in this locality is so mild that ice can not be obtained in sufficient quantities to supply the demands and needs of this city and locality; therefore ice-factories have been established to supply this demand. There are now three ice-factories in active operation. Ice is furnished in large quantities for 28½ cents per 100 pounds and in small quantities for family use as follows:

	Weight.	Price per month.
	Pounds.	
One-half block	10	$1.78
One block	20	2.38
Two blocks	40	3.57

EVANS BLAKE,
Consul.

UNITED STATES CONSULATE,
Crefeld, February 25, 1890.

DRESDEN.

REPORT BY CONSUL PALMER.

Refrigerators are used to a very large extent in this consular district and there is hardly a hotel, restaurant, or household of any extent without one.

They are constructed in different sizes to suit various purposes. It is the general feature of these refrigerators to have one ice compartment and a second compartment for the food and liquid to be preserved. The refrigerator is generally divided by a vertical partition, the one compartment being in its lower part provided with a grating for the ice to rest on and to keep clear of the melting water, the other compartment being divided by horizontal boards to receive the articles to be preserved. In larger refrigerators the ice compartment is arranged in the middle of the furniture, the two sides forming the two compartments for receiving the articles to be preserved, the walls of the refrigerators being made double and filled with a non-conductor of heat, all the inner walls, grating, and boards in the refrigerator being covered with zinc.

The sizes, formations, and prices are varying. The refrigerators of this establishment are of oak, varnished, lined with strong zinc, and with all latest improvements. Nos. 1 to 4, one door; Nos. 5 to 8, two doors.

The measures are in centimeters for the height, width, and depth, and the prices in marks. These refrigerators are, of course, of the smaller kind and for household purposes.

Ice is stored here in cellars or in so-called "Americans," that is, overground, in light houses with double walls. The price for storing ice varies according to the character of the winter. It costs from 10 to 25 pfennig, all included, breaking, loading, carriage, and storage, per 100 pounds.

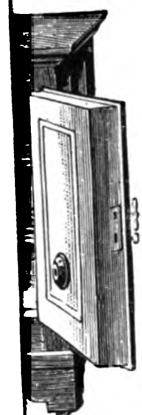
It is sold, according to variations of first costs, at subscription by the owner of the storage cellars to hotels, restaurants, and households. It is very often made a point by the restaurants that the brewery delivering the beer shall supply the ice gratis.

Formerly the refrigerators were especially constructed to receive casks with beer. This system is generally abandoned on account of the system for raising the beer in pipes by air pressure, the beer passing through a refrigerator consisting of a closed vessel filled with ice, through which the beer-pipe passes as a coiled serpentine.

In regard to the best manner of introducing refrigerators into this consular district, I can only say that the ordinary trade way of having them properly exhibited by a competent agent would be most likely to succeed.

AULICK PALMER,
Consul.

UNITED STATES CONSULATE,
Dresden, March 12, 1890.



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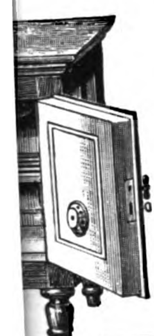

DÜSSELDORF.

REPORT BY CONSUL PARTELLO.

Refrigerators are used in this consular district, but only within the last few years to any extent. On account of the location of the district in a northern latitude, the absence of great heat during the summer months, and the fact that most of the houses have good cellars, the necessity for their use seemed not to be felt until of late, except in the case of large ones constructed as a part of the business place of butchers, dairymen, etc.

The improvement that seems to be gradually making its way in the building of houses and in other comforts and conveniences in the domestic life of the Germans has among the better classes brought into general use refrigerators.

The peculiar features of refrigerators for this market are shown by the inclosure, "Refrigerators in general use in Düsseldorf," which shows the general plan of their construction.

The refrigerators used in this district are manufactured in the several cities within the district, the principal establishments being Düsseldorf and Cologne.

Ice is secured in this district from small lakes and ponds, a number of which are kept expressly for the purpose. They are carefully watched, kept clean, and specially cared for. The cutting and hauling is about the same in manner as is customary in the States, and ice-houses are built on the same general plan.

The price of ice per 100 pounds will average about 24 cents to hotels and restaurants; the rate to private consumers about 30 cents.

GENERAL REMARKS.

Refrigerators for use of hotels, butchers, and dairy stores are constructed as a part of the establishment. The plan is mostly of wood, with stone floors, hollow sides filled with sawdust; though numbers are built of stone, sometimes marble, laid in cement, and others neatly tiled on the outside. In regard to the American system of preserving food and liquids, it is believed with the knowledge the Germans have in this respect and the general use of refrigerators it would be a difficult matter to induce them to make any change.

The general plan of the new refrigerators manufactured here is fairly good, many ideas having been copied from the American goods, and on account of the duties, that would have to be paid, added to freight, and considering the reasonable price of those manufactured in Germany, it is my opinion that it would be a difficult matter to introduce with any profit the refrigerators of American manufacture within this consular district.

D. J. PARTELLO,
Consul.

UNITED STATES CONSULATE,
Düsseldorf April 19, 1890.

FRANKFORT-ON-THE-MAIN.

REPORT BY CONSUL-GENERAL MASON.

Refrigerators are very generally used in this district, particularly in Frankfort, where the average of wealth is high and the prevalent style of living luxurious and liberal. The use of ice for domestic purposes, which was considered a luxury a generation ago, is now regarded a necessity of daily life during the summer season. The use of ice in winter is far less general here than in the United States, for the reason that ice-water is rarely or never drank. Brewers and butchers use ice in this country precisely as they do in the United States. When winters are cold enough to furnish natural ice they gather it from ponds and overflowed meadows; when the natural supply fails they manufacture it, most of the large breweries being equipped with ice-making machinery of their own.

The refrigerators used in this vicinity are manufactured mainly by two large factories, one of which is located in Frankfort, the other in the neighboring village of Bockenheim. They are nearly all more or less literal copies of American or English ice-chests, and therefore can hardly be said to embody any important original features to distinguish them from the models from which they have been adopted. In answer to the queries concerning the sizes, formations, and prices of the refrigerators manufactured and used here, there is appended to this report a page from the illustrated circular of one of the local establishments already alluded to, which not only manufactures refrigerators at its factory in Bockenheim, a mile beyond the city limits of Frankfort, but has natural ice ponds and store-houses at Hanau, about 12 miles distant, and an artificial ice manufactory in this city from both of which ice is supplied and delivered to customers throughout the season the same as in American cities. As will be seen from the illustrations, the ice-chests offered do not differ essentially in form or construction from those in ordinary use at home. They are made of light wood, painted and grained to resemble oak or walnut, and are lined with zinc. In large chests the walls are double and filled with charcoal. The prices given in the circular are those of 1889. On account of the advance in the cost of coal and iron, mainly by reason of strikes among miners and iron workmen, the price-list of the coming season will be 10 per cent. higher than those printed in the circular, the equivalents of which are added in American currency. It will be seen that the prices given are low. This is true of all German copies of American machinery or appliances that I have examined. The quality is also more or less inferior to the original, particularly in respect to exterior finish and nicety of adjustment, but they are all good enough for every-day use, and their cheapness is an argument which, to the German purchaser, is decisive in favor of the home-made article.

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Ice is secured in this district, as already intimated, both from natural and artificial sources. There are no large lakes in this region and the Main is too swift a stream to make thick ice except during the occasional severe winters, which are too rare and uncertain to be depended upon. But there are a number of small artificial ponds made by damming small streams, from which a fair supply is obtained in ordinary seasons.

From an illustrated catalogue before me it is apparent that the Germans have horse-plows, steam traction, and all the essential modern improvements in ice gathering. Their store-houses are of wood with the exterior walls filled with tan-bark, and in respect to convenience of equipment are in no respect inferior to the great establishments along the Hudson River. Prices vary according to the success which attends the harvest of natural ice and consequently the proportion of artificial ice which has to be made to meet the deficit in the natural supply. The schedule for 1890 has not yet been announced, but thus far little or no ice has been gathered, and as it is now probably too late to expect more than a limited harvest of thin and poor quality, it is probable that prices during the coming summer will be considerably higher than during the warm months of last year, which was a fair average season. The prices which ruled then may be accepted as the average for ordinary seasons and were as follows:

For daily delivery from April 12 until September 30. Per day for the season, 5 pounds, $4.28; 10 pounds, $5.99; 15 pounds, $8.33; 20 pounds, $10.

Monthly subscription for not less than thirty consecutive days, per day, 5 pounds, 3½ cents; 10 pounds, 4¾ cents; 15 pounds, 6 cents; 20 pounds, 7½ cents.

Persons living near the depots of the company in this city can save 10 to 15 per cent. from these prices by taking their ice from the depot instead of the delivery-wagons.

Coming finally to the main question whether there is in this district any practical field for the introduction and sale of American refrigerators, it would seem to follow from what has been already stated that the prospect is not highly encouraging. Some years ago refrigerators of the Brainard (American) pattern were introduced here by means of originals or copies, but they did not please and the effort was abandoned. If there is an American refrigerator capable of being made in suitable sizes and patterns for the varied uses of families, cafés, and hotels, and which, besides being superior to those in ordinary use, is so original and distinctive in construction that it can be protected by patent from indiscriminate imitation, there might be an opportunity here for its successful introduction. The duty on fixtures of that class imported from foreign countries is $1.19 per 220 pounds, but the bulkiness of such merchandise in proportion to its value would make the question of ocean freights of vital importance.

In the manufacture of artificial ice, or almost any industrial application of chemistry or other kindred science, the Germans are masters, and have little to learn from any other people. Their machinery, implements, and many forms of manufacture lack originality and the perfection of finish and fitting which characterizes American goods, but they manage even in these departments to make something that will answer the purpose, and to make it cheap. In respect to a fixture so simple and easy to imitate as a refrigerator they would probably be very difficult people to compete with on their own ground.

FRANK H. MASON,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Frankfort-on-the-Main, January 31, 1890.

HAMBURG.

REPORT BY CONSUL JOHNSON.

On receipt of the Department's circular of November 25, 1889, I applied to the proper Hamburg authorities for the information called for in the same; but, owing to the dilatoriness of these authorities, I was only furnished with a very unsatisfactory reply under date of March 10, 1890. This report being non-responsive to the interrogatories propounded in the Department's circular, I have endeavored to collect the information myself and submit the result below.

Refrigerators are used in almost every household in the towns and cities of this district; their use is, however, confined to the summer season alone, the cellars in most houses being sufficiently cool to preserve articles of food, etc., during the winter months. The restaurants and beer taverns, however, make an exception, using ice in their refrigerators almost throughout the year.

There are hardly any peculiar features required in the construction of the refrigerators. They vary in size only and consist of wooden cases lined with zinc, a space of a few inches between the wood and the metal being filled with thoroughly dried sawdust. Those in use in this district are mostly manufactured in Hamburg or Altona. As the simplest means of illustrating the sizes, formations, and prices of the refrigerators in use in this district, I annex an illustrated price-list of the Actien-Gesellschaft-Eiswerke, Hamburg, which is about the most important concern of the kind in Hamburg. Only these seven sizes are constantly manufactured and kept in stock, but orders for larger ones are executed to suit the purchasers. There are only three or four firms in this city who store and deal in ice. The ice is cut in canals and small lakes near the city and stored in ice-houses very similar to those in use in the United States. The quality, however, is poor, owing to the filthiness of the water; the ice is consequently fit only for cooling purposes. The price per 100 pounds varies from 12 to 15 cents; after mild winters, however, it has commanded as high as 18 cents.

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The consumption of ice in the city of Hamburg alone, exclusive of the breweries, slaughter-houses, etc., is about 100,000 tons per annum.

As the best means of introducing refrigerators into this district I should suggest a direct communication with the dealers through the aid of our consular officers.

CHAS. F. JOHNSON,
Consul.

UNITED STATES CONSULATE,
Hamburg, February 28, 1890.

[Translation.]

HAMBURG CHAMBER OF INDUSTRY,
Hamburg, February 24, 1890.

His Honor Senator Dr. BURCHARD, etc.,
Present:

The Chamber of Industry has the honor to comply with the request of January 17, received January 20, 1890.

There can be no doubt that ice-boxes, and not other cooling-apparatus, are meant by the term "refrigerators," as it appears defined in the two passages following interrogatories 1-5 of the inclosure which is returned.

Refrigerators are extensively used here; they are of various sizes and construction, and the prices also vary greatly according to quality.

As far as we know there are no manufactories in Hamburg which build refrigerators on a large scale. Some few are manufactured at Ottensen (near Hamburg), but otherwise they are imported from districts with cheaper lumber and labor-prices.

Respectfully,

THE CHAMBER OF INDUSTRY,
BAUR, *President.*

MAYENCE.

REPORT BY COMMERCIAL AGENT SMITH.

Refrigerators are used to a considerable extent in this consular district by people of the upper and middle classes, and they are coming more and more into general use all the time. They will soon be found in every family of fair standing.

So far as I have been able to ascertain, no peculiar features of construction are called for by the public. The chief requirement is that they should be cheap, and they are sold at remarkably low figures—prices with which, I think, the Americans could not possibly compete with any satisfaction. Price always plays a very important rôle with the German, and is, to a large extent, the determining factor with him in the purchase of many articles. The manner of construction of the different kinds of refrigerators chiefly in the German market will be shown by the descriptive catalogues herewith transmitted. Slight improvements of various kinds in construction are constantly taking place.

The refrigerators sold by the leading firms here at Mayence and at Wiesbaden, a city near by of some 55,000 inhabitants, are all of German make, and are manufactured in Dresden, Gaggenau, near Rastatt, in Baden, at Düsseldorf, at Aschaffenburg, and at Cassel. These are said to be the leading places of manufacture in Germany. There are no

others of any account, I have been told, except, may be, at Chemnitz, where handsome and expensive articles, not much purchased by the general public, are manufactured.

The best refrigerators now made in Germany, a large dealer informs me, are probably those manufactured at Gaggenau, in Baden. They are constructed upon a new principle and have been in the market only two or three years. Being the best, they are also the dearest, but not much dearer than other makes.

The Eschebach & Hausner refrigerator (Dresden) are lined with zinc and the spaces between the sides are filled in with wheat chaff, I am told. All of their refrigerators, except the catalogue numbers 1701, 1702, 1703, 1704, 1705, 1706, and 1735 are made of oak, with the inlaid parts varnished to resemble maple, while these numbers are of old oak, with the inlaid pieces painted to look like English walnut; that is, like light walnut. The refrigerators Nos. 1711 to 1714 have a good lock, with a nicely nickel-plated brass escutcheon and key, while all the others have a double lock with a handle, the key, escutcheon, and handle being of brass, nicely nickel-plated. The refrigerators 1701 to 1719 and 1735 have each a divisible grate, so that but half of it need be taken out whenever desired. All the sizes 1701 to 1722 and 1735 are provided with removable ice chests or boxes, to make the cleaning of them easy. The stop-cocks for letting the water off are all of nicely nickel-plated brass. The tops of the refrigerators present a smooth surface when the lids, by which the ice is let into the refrigerators, are down, as the handles to them are made to fit into them so as to make a flat surface. The upper outer surface of the lids is of iron plate. Provision is made for the carriage of the sweat-water that forms on the ice-boxes into a receptacle therefor, and thus prevent it from collecting on the bottom of the compartment for food. The refrigerators 1701 to 1722 and 1735 are sold with pinked ice-boxes, to accelerate the refrigerating. An enameled ice-water cooler can be had with all the refrigerators for a dollar or two extra, and a filter also to go with it. The ice is put into the refrigerators at the top into a compartment that reaches from the top to the bottom of the refrigerator. The cooling is effected from the sides of these compartments.

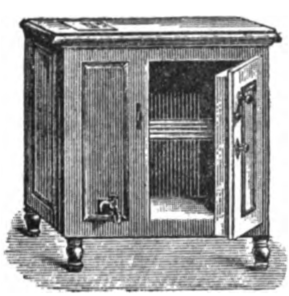
On Eschebach & Haussner's refrigerators the trade are given 20 per cent. discount on the catalogue prices. The packing and freight are borne by the trade.

One dealer selling Eschebach & Haussner's refrigerators informed me that he sells most of No. 1713 on the catalogue, which is sold at $8.56 retail, without ice-water cooler. The wholesale price is $7.14.

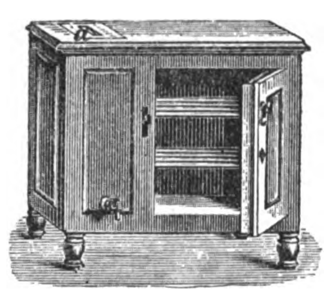
The refrigerators of the Eisenwerke Gaggenau, in Baden, are constructed upon what is known as the jalousie system; that is, ventilated by means of slats or bars, upon the principle of the Venetian blind. In this refrigerator the cooling is done from the top, which is its leading characteristic and a departure from the established method, I understand. The inventor of it claims that thereby more room is obtained

in the refrigerator with the least waste of ice and lowest degree of temperature with proper circulation of air. The ice-chest or box hangs freely in the upper part of the refrigerator. It is made with slats. The cold air streams out between the slats and naturally passes down into the refrigerator, while the arising warm air becomes commingled with the cold streams coming from above and brings about a regular circulation of air. The water, as it condenses in the ice-box, drops from slat to slat, collects at the bottom, and runs through a pipe into a reservoir, where it can be used to cool liquids, etc. The ventilation is claimed to be superior to that in other refrigerators. Hitherto it has been effected through the door in front and the back, which the inventor of the Gaggenau refrigerators claims has been only to bring in warm air without actually airing the refrigerator. The bad air he gets out by means of a pipe through which it ascends. Through this arrangement the refrigerator is freed of unpleasant odors and the melting of the ice materially retarded by the exclusion of all warm air. The filling is of slag-hair.

Of Schmidt & Keerl's refrigerators I have only a descriptive sheet, with cuts of the refrigerators and their sizes upon it. Their wholesale prices have been given me by a dealer. On these prices they allow 10 per cent. off, but the packing and freight equalizes this. Three months' time is granted, with a discount of 1½ per cent. for cash payments made within two weeks. The refrigerator that sells best is No. 3, sold at about $9.50 retail. Their refrigerators are constructed on the jalousie system, are lined with strong zinc, and the spaces between the sides are filled in with slag-hair. They all have removable ice-boxes, permitting easy cleansing. Waste water is carried off by a pipe into a basin that goes under the refrigerator, when there is a superfluity of water through neglect to let it off by the regular stop-cock. Their refrigerators can all be had either plainly painted or nicely varnished. The refrigerating is done from the sides of the compartments or boxes containing the ice.

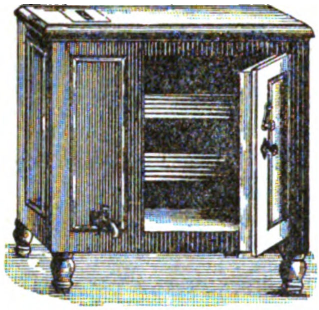


No. 2.—Height, 30$\frac{3}{10}$ inches; length, 26$\frac{3}{10}$ inches; depth, 19 inches; weight, 79 pounds; price, *$6.50.

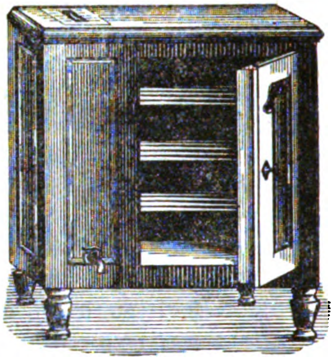


No. 3.—Height, 31½ inches; length, 31½ inches; depth, 19$\frac{3}{10}$ inches; weight, 90 pounds; price, $8.50.
a This lid raises and the ice goes in here, from top to bottom.

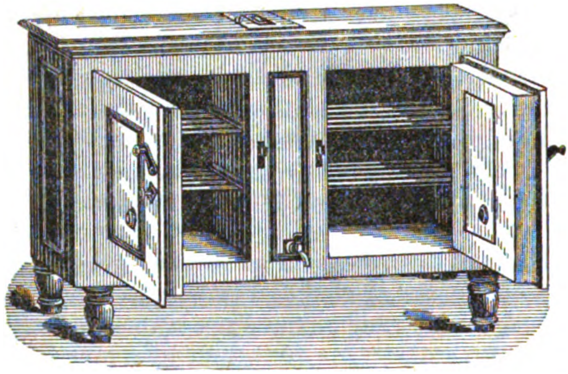
* The prices are all for varnished refrigerators.



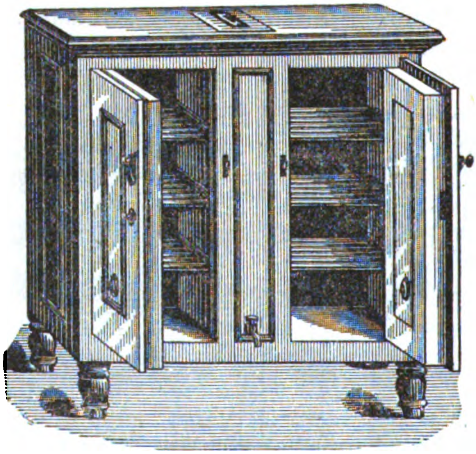
No. 5.—Height, $35\frac{1}{2}$ inches; length, $32\frac{3}{10}$ inches; depth, $20\frac{1}{2}$ inches; weight, 116 pounds; price, $10.25.



No. 6.—Height, $30\frac{3}{10}$ inches; length, $34\frac{8}{10}$ inches. depth, $22\frac{8}{10}$ inches; weight, 154 pounds; price, $12.



No. 7 a.—Height, $39\frac{3}{10}$ inches; length, $45\frac{8}{10}$ inches; depth, $23\frac{8}{10}$ inches; weight, 215 pounds; price, $16.66.



No. 7 b.—Height, 50 inches; length, $45\frac{3}{10}$ inches; depth, $26\frac{1}{2}$ inches; weight, 286 pounds; price, $22.

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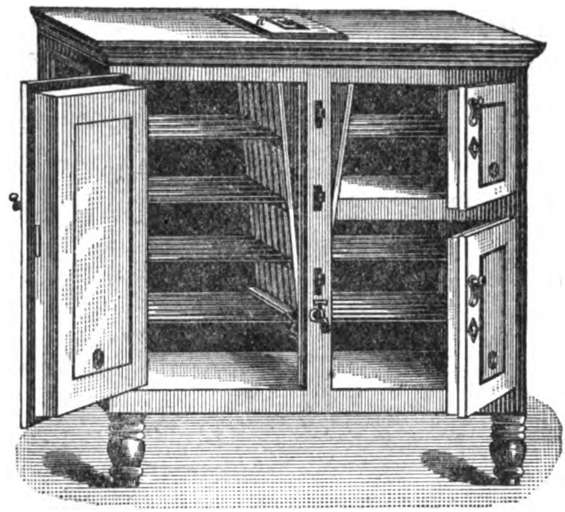
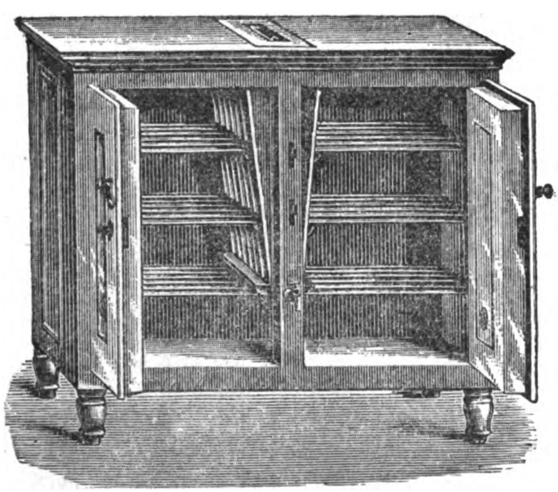
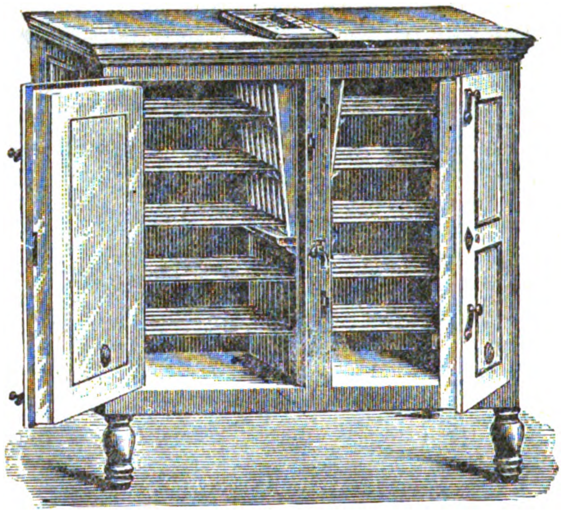
a Ice receiver extending from top to bottom of refrigerator.



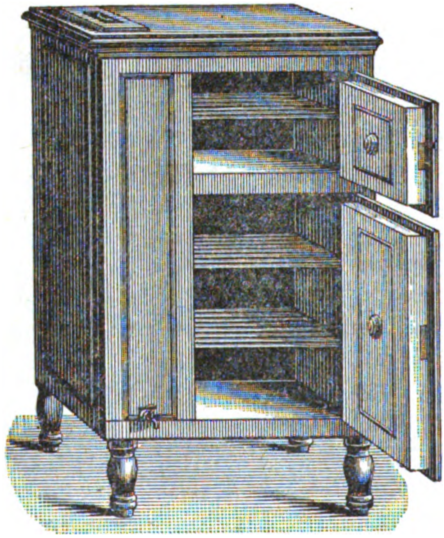
No. 17. (For a store).—Height 59 inches; length, 55 inches; depth, 31½ inches; weight, 484 pounds; price, $29.75.



No. 16. To hold food and wine for a store.—Height, 51$\frac{1}{10}$ inches; length, 55 inches; depth, 31½ inches; weight, 455 pounds; price, $25.

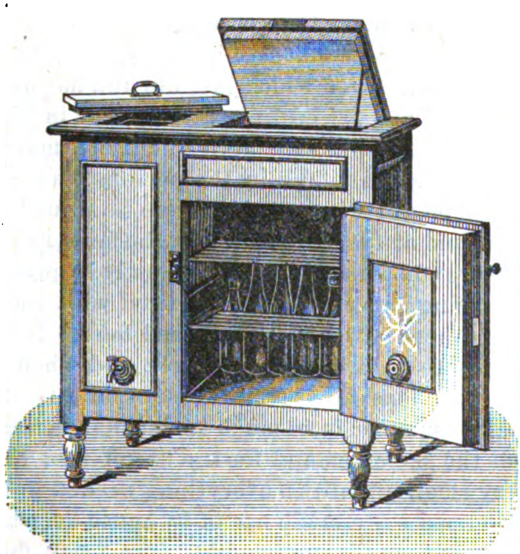


No. 27.—Height, 59 inches; length, 55 inches; depth, 31½ inches; weight, 484 pounds; price, $32.13.



No. 19.—Height, 62$\frac{8}{10}$ inches; length, 35½ inches; depth, 26½ inches; weight, 286 pounds; price, $20.25.

No. 36 (for butchers and hotels).—Height, $62\frac{3}{16}$ inches; length, 49 inches; depth, $27\frac{1}{2}$ inches; weight, 528 pounds; price, $38.



No. 9.—Height, $43\frac{3}{16}$ inches; length, $34\frac{6}{16}$ inches; depth, $22\frac{8}{16}$ inches; weight, 176 pounds; price, $15.23.

There are two or three more cuts of refrigerators for large butchers and hotels, which I do not think it necessary to give.

In conclusion, I have to say that the catalogues and prices furnished by me have been given me by dealers, and that the trade expect to make a profit of 20 to 30 per cent. on refrigerators sold by them.

JAMES H. SMITH,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Mayence, March 3, 1890.

MUNICH.

REPORT BY CONSUL MEALEY.

Refrigerators are used, but very few; outside of the city of Munich you may say not at all. The hotels and restaurants use them, but not all of them, and very few private families make use of them. The business in perishable articles of food is done by small stores or shops, of which an immense number are located in every quarter of the city, and it is the universal custom for people to buy from day to day such articles as they need. In fact very many buy twice a day; that is, for each meal.

The only thing, or the main thing, asked for by would-be purchasers of refrigerators here is that they be cheap, and the endeavor of the maker is to supply a very cheap article. There is only one peculiar feature to be noted: the ice-box is made to receive a rectangular block of artificial ice about two feet long and about five inches square, the ice being first placed in a sort of a wire cage which just fits and has handles to facilitate its being lowered and raised from the ice box in the refrigerator.

I can learn of none that are sold here which are manufactured anywhere except here in Munich, and by the persons who sell them. I can only learn of those people who sell them here in Munich.

Both natural ice and artificial ice are used, the former by butchers, beer breweries, and large consumers, the latter mostly by private consumers, the artificial ice being cleaner. But compared with the use of ice in the United States there is very little ice used here. It is a rare thing for a private family to use ice in any manner, and when they do it is a very small quantity. There are several reasons for this. Suffice it to say that the weather in summer is so much cooler than in the United States that there is not the same demand for the use of ice; then the custom of buying in very small quantities everything needed in the house, and the cellars of the houses are made use of by house-keepers for the keeping of all articles that may be perishable. The price for artificial ice, delivered in the refrigerator, is about 75 cents per 100 pounds; the price of natural ice about 70 cents per 100 pounds. The ice is delivered to private families twice a week in summer and about once a week in

spring and fall. Some restaurants and cafés have refrigerators for keeping the barrel of beer they are drawing from, but they are few as the beer is considered to be somewhat spoiled by being kept too cold by means of ice. I very much doubt if the sale of refrigerators could by any possible means be much increased here, as there is very little demand for them, and, as I have stated above, the climate does not make their use very pressing or necessary.

EDWARD W. MEALEY,
Consul.

UNITED STATES CONSULATE,
Munich, February 4, 1890.

STETTIN.

REPORT BY CONSUL FAY.

The common house ice-chest is extensively in use and is sold at a very low price in Stettin.

One may purchase an ice-chest sufficiently large for family use for $5. They are very conveniently arranged and well made.

As the duty on refrigerators of any sort is very high, about $1.25 per 100 pounds, I imagine it would be hard to compete with the German manufacturers in this branch at the prices at which they are sold in Stettin.

The larger class of refrigerators, such as are in use by provision dealers and butchers in America, are not to be seen here.

Ice being so very plentiful and cheap, such dealers fill their cellars therewith in winter and preserve the meats, etc., therein during the hot season. Ice is retailed at one-eighth to one-quarter cent per pound during the summer season.

ANDREW F. FAY,
Consul.

UNITED STATES CONSULATE,
Stettin, February 9, 1890.

HOLLAND.

AMSTERDAM.

REPORT BY CONSUL ECKSTEIN.

Refrigerators are used in Holland in nearly all hotels, restaurants, cafés, butcher-shops, hospitals, and in other public institutions, but only to a limited extent in private families or boarding-houses.

By the general public, refrigerators are regarded more in the light of an article of luxury than of necessity so far as their use is concerned in private houses.

A variety of circumstances obviate the necessity of their use, chief amongst which are that intensely hot weather rarely prevails many days together during any summer, whilst there always exists more or less humidity or moisture in the atmosphere, which keeps articles of food, such as meat, fish, vegetables, etc., in a sound condition for such time as such supplies are ordinarily provided for.

Besides there exist in this country, in the large cities, smaller towns, and even in the country, great facilities for procuring all sorts of perishable articles conveniently for daily use.

I am assured no particular or special features are required in the construction of refrigerators for use in this country for either preserving food or liquids. In answer to this point, more detailed information is conveyed in reply to the fourth question.

Most of the refrigerators used in Holland are imported from Aschaffenburg, Bavaria, and other places in Germany, and some are imported from England and France.

Formerly they were an article of domestic production to a certain extent, but their manufacture in this country has stopped, from all I can learn.

The greater part of the ice used in this country consists of sweet-water or artificial ice. It is manufactured by the principal breweries for their own consumption as well as for sale.

There are also two large ice companies, one operating in natural ice and the other manufacturing the artificial article.

Natural ice is secured here by being cut out of the river Amstel, in ever varying quantities and qualities from year to year, according as the season is mild or severe. It is also imported in large quantities from Norway.

The price per 100 pounds is about 0.50 florin (20 cents), and in large quantities, by the ton of 2,200 pounds, it can now be contracted for and delivered at 8 to 9 florins ($3.20 to $3.60) per ton.

As is represented to me, it would be advisable for American manufacturers of refrigerators who desire to introduce into this country successfully the product of their manufacture, and with a prospect of finding a permanent market for it here, to consign to some trustworthy person or persons, as agents in this city and in a few of the other large cities in this country, small assortments of refrigerators of different styles and sizes and varying prices.

Having secured energetic and pushing agents for the introduction and sale of the article the demand for them may spring up if the prices of our manufacturers can compete with those at which the product of other countries is selling here.

As such an agent I can unhesitatingly mention and recommend the firm of Fred Stieltyes & Co., at Amsterdam.

I would also mention here the firm names of the principal retail dealers in refrigerators at Amsterdam, with whom some of our manufacturers of refrigerators may find it to their advantage or desirable to correspond or make offers to.

They are: E. B. Vieth, F. L. A. de Gruyter, L. Dake & Son, Widow Kirchmann & Co., J. Peignat & Co., L. A. C. Victor, Becht & Dyserinck, and J. B. Gorris.

D. ECKSTEIN,
Consul.

UNITED STATES CONSULATE,
Amsterdam, March 28, 1890.

ITALY.

CATANIA.

REPORT BY CONSUL LAMANTIA.

There are no manufactories of any such articles, and the American refrigerator is entirely unknown in this section of country.

I have also made inquiries of the several hotels and restaurant proprietors on the subject, who told me that they use no refrigerators in their establishments, as they have no use for them, for the reason that during the summer season they buy sufficient provisions to do for the daily consumption.

Mr. M. Patriarca, however, an importer and wholesale and retail dealer in national and foreign goods, of this city, informs me that he imports small refrigerators from Germany, the size being 20 inches wide by 24 long and 30 high, which he sells for 45 lires each, but says that there is a very little sale of them, on account of such a high price; consequently it is a hard matter in this section of country to dispose of such articles at more that 30 lires ($8.68) each. If, however, he adds, small American refrigerators of said size, economically constructed, could be laid in this market for 20 or 25 lires ($3.86 to $4.83) each, he thinks at such a price their introduction, extension, and sale could be easily secured.

As far as ice is concerned, there are two ice factories in this city, supplying the wants of the people, and the same is sold at 9 lires per 100 kilos.

VINCENT LAMANTIA,
Consul.

UNITED STATES CONSULATE,
Catania, February 15, 1890.

FLORENCE.

REPORT BY CONSUL DILLER.

Refrigerators are used in this district by the leading hotels, pensions, coffee, and beer houses, and by a few of the prominent residents and clubs.

No peculiar features are required in their construction. Many of them are of the most primitive construction, being merely an ordinary box, with a compartment for ice, not lined, with perforated bottom. The better kinds used are generally poor imitations of the American or

English styles, and are manufactured in Milan and Germany. The sizes and formation are similar to the above, with the exception that, instead of wood, zinc or tin is used as the outside covering, and the non-conducting space between the outside and inside lining is greatly contracted, thus deteriorating from their value as preservatives. The imitation American refrigerators, in three sizes, are sold at $9, $17, and $27 respectively, and the English, in the form of benches, in two sizes, at $25 and $30.

The ice used in refrigerators in this district comes from the Appenines, is of poor and porous quality, and is sold at about 20 cents per 100 pounds. Pure clear ice for drinking purposes comes from Poretta, on the boundary between Florence and Bologna, and costs about 25 cents per 100 pounds.

The usual way of preserving food and liquids at the present time is by keeping perishable articles in cool cellars or by suspending them in wells.

I am of the opinion that if a cheap form of refrigerator, made of wood, was introduced it might in time be quite generally adopted, but in order to sell it at a low price, the adjuncts, such as lock, knob, hinges, zinc, wire fittings, and castors should be unattached to the wooden case, accompanying the same, however, in a separate package, to be fitted after arrival.

According to the Italian tariff the duty on manufactures of wood averages about $9 per 100 kilos (220.46 pounds), while the duty upon the fittings, such as I have mentioned, would be at least $14 per 100 kilos; and according to the manner of estimating duties in Italy the duty would be levied on the complete machine, as a whole, at the higher rate, while on the contrary, if the fittings were not attached, the duty would be levied on each article separately, according to weight and kind of material. This is an important item to be considered in exporting refrigerators to Italy. It is not the component material of which an article is composed which regulates the duty charged on the article as a whole, but upon any other material which forms a part of it, however small, upon which the duty is greater than that of the component part, if attached to it.

ISAAC R. DILLER,
Consul.

UNITED STATES CONSULATE,
Florence, January 17, 1890.

GENOA.

REPORT BY CONSUL FLETCHER.

Introductory.—It is no exaggeration to state that more refrigerators can be found in any city of 10,000 inhabitants in the United States than in this entire consular district of over 900,000 souls. Further, it is safe to say that no more ice is consumed in the city of Genoa with

its 180,000 inhabitants than in any city of the United States whose population contains not more than 10,000 or 12,000 people. All this, too, in a country with mild winters, warm spring-time and fall, and very hot summers.

Several reasons can be given for this limited demand for refrigerators and ice, a few of which are as follows:

The Italian people do not consider ice necessary at any season in order to enjoy good health or a good appetite; many of them believe ice injures rather than soothes the palate and stomach.

Economy is practiced here to such an extent that fully ninety-seven families out of every one hundred purchase only sufficient food for daily wants. Nothing remains over for the morrow—not even bread or vegetables. Such being the case, the question, "Why are not refrigerators used in the homes of the Genoese more?" is easily answered.

The use of refrigerators in this consular district is very limited.

There is nothing peculiar in the construction of those in use here.

Those now in use were either brought from Germany or England. Of late the Italians have commenced the manufacture of these articles, but on a limited scale.

The sizes, formation, and prices of refrigerators offered for sale here are as follows:

Portable refrigerators.

[All finely polished in varnish and lined with zinc.]

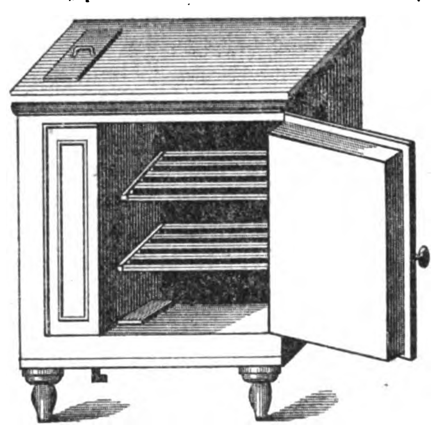


Fig. A.

WITH ONE DOOR.

	Height.		Width.		Depth.		Price.	
							Improved quality.	Common quality.
	Feet.	*Inches.*	*Feet.*	*Inches.*	*Feet.*	*Inches.*		
FIG. A.—No. 1	2	5.13454	2	0.01631	1	7.29179	$6.95	$5.60
No. 2	2	6.70938	2	3.55970	1	9.65405	7.70	....
No. 3	2	7.49680	2	5.13454	1	11.62260	8.90	6.75
No. 4	2	9.85906	2	6.70938	2	0.41002	10.60	8.70

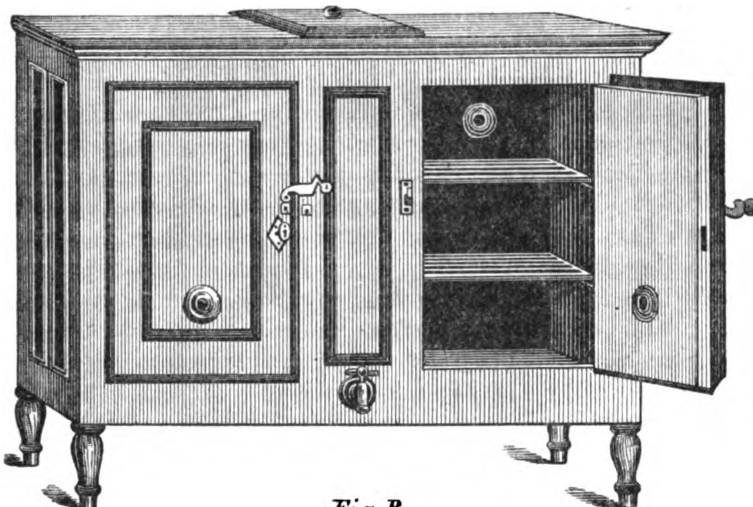


Fig. B.

WITH TWO DOORS.

	Height.		Width.		Depth.		Price of Improved quality.
	Feet.	*Inches.*	*Feet.*	*Inches.*	*Feet.*	*Inches.*	
FIG. B.—No. 5	2	5.13454	3	1.40245	1	7.6855	$12.55
No. 6	2	7.49680	3	6.52068	1	11.62260	15.45
No. 7	3	3.37100	3	3.37100	2	0.41002	17.40
No. 8	3	7.30810	3	7.30810	2	1.19744	19.30

Ice fit for table use is taken from the little ponds and streamlets along the mountain sides (along the maritime Alps and Appenines). It is packed in small caves especially prepared for the purpose in the hill sides, near the place where it is harvested. When these caves are nearly filled a covering of leaves from chestnut trees, about two feet in thickness, is placed on top of the ice—nothing more.

Ice is brought into Genoa both by wagons and by rail. A city tax of about 39 cents per 100 pounds is imposed on all ice conveyed within the gates of Genoa. But, notwithstanding this tax, cartage, etc., the article is sold and delivered where ordered at $1 per 100 pounds.

* * * * * * *

Conclusions.—As already stated, the people here purchase day by day the requirements for the day—no more. This habit is also practiced as much as possible at hotels and restaurants, and the consequence is that very few refrigerators can be found even in those places. Some of them have common boxes, in which is placed the ice, and over which are thrown woolen cloths or blankets.

Some of the liquor shops have boxes also, with ice covered as above. But in the 2,000 or more wine shops and liquor stores in this city, it is no strain of imagination to say that you can not find a particle of ice in more than 150, no matter how hot the summers may be.

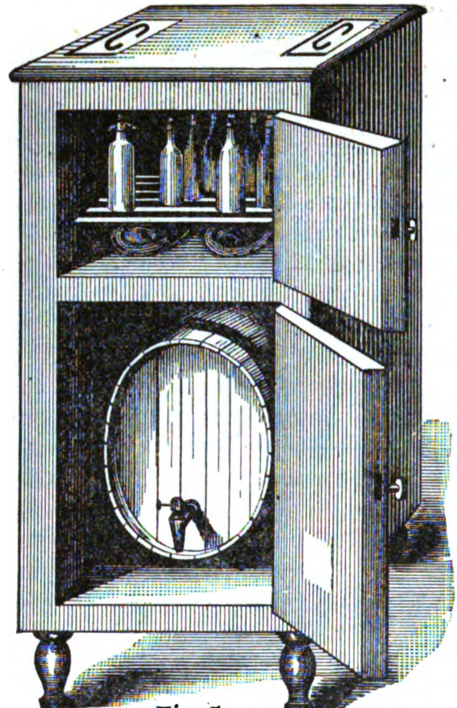


Fig. C.

FIG. C.—Beer Refrigerator, from $28.30 to $48.55.

As far as personal observation goes the people of this district prefer wine, liquor, and even water, each in its normal temperature, much more than when cooled by ice or by any artificial process.

Foreigners, chiefly Americans and English, are the great patrons of ice in this part of the country; but even those people, after a lengthened stay here, adopt the habits of the natives and abstain from the use of this cooling substance.

Managers of hotels, owners of provision stores, of restaurants, liquor shops, and meat markets, might be pursuaded to invest in American refrigerators providing parties interested in the sale of such wares were here personally to point out the merits of the goods.

The establishment of agencies under foreigners, unless said foreigners have money invested in the manufacture of the wares, will not pay in Genoa.

JAMES FLETCHER,
Consul.

UNITED STATES CONSULATE,
Genoa, February 1, 1890.

PALERMO.

REPORT BY CONSUL CARROLL.

Refrigerators were introduced into Palermo about one year ago, since which, it is understood, about forty have been sold.

To suit the requirements of this district, refrigerators should be of medium size, gorgeous in finish, and moderate in price, the maximum not to exceed 100 lire, or about $20 each. Walnut, or imitations thereof, embellished by various decorative designs, would take well, so would also pitch-pine, similarly finished. All articles, in order to find favor or a market here, must be of a gaudy nature, as a rule.

The refrigerators in use here are of German manufacture, but are generally represented to have been manufactured in the United States.

Refrigerators should be of various sizes and forms, showy or attractive in appearance, with brass or nickel knobs or other showy material. The most expensive refrigerator in Palermo is understood to be offered for 250 lire, or about $50, but few, if any, at this price can be sold. The refrigerator which is understood to have met with the most favor here thus far, costs 60 lire, or about $12. Refrigerators whose forms are somewhat similar to book-cases or ladies' dressing-cases, containing a mirror, would, it is said, meet with great favor here.

Ice is manufactured in Palermo, and costs, at retail, from 4 to 6 cents per kilogram, depending on the season and the weather; the wholesale price thereof varying in like manner, but never being less than 2 cents per kilogram, and often 3 or 4, or more. Snow is also used, and costs from 3 to 5 cents per kilogram retail and about 2 or 3 wholesale, the price, however, varying as in the case of ice.

Unquestionably not only refrigerators but all other articles of American manufacture are more popular here than those of any other country, and the best proof of this is the fact that nearly every dealer or merchant advertises American articles for sale, while the great majority have not a single article of American manufacture in stock; but as a good business appears to be transacted in thus misleading the public, dealers are happy and content.

The best manner of introducing refrigerators here is for dealers therein to send samples of each variety to some reliable person, in order that those desiring them may see by comparison the difference between the spurious and genuine American article. They should be offered for sale on the same conditions accorded dealers here by the Germans, English, etc., which is from three to six months' credit. Few, if any, houses in Palermo can be induced to pay upon delivery.

There is no method of preserving foods or liquids save leaving the doors and windows of butcher-shops open during the night, in order to let in the cool air, the reverse being done during the day. In private houses liquids, and such meats, etc., if any, as may be in the house, are placed on the balconies with a view of preserving them.

Living is so expensive here, and the people generally so poor, that the purchase of meats and certain other articles of food has become somewhat of a science, so that when the meal is completed there is nothing left, as a rule, to preserve. Hence the necessity for refrigerators is not great.

PHILIP CARROLL,
Consul.

UNITED STATES CONSULATE,
Palermo, January 29, 1890.

SOUTHERN ITALY.

REPORT BY CONSUL CAMPHAUSEN, OF NAPLES.

In answer to questions 1, 2, 3, and 4 of the circular, I respectfully report that the use of the refrigerator is at present almost as unknown in this district as in the time of the old Romans.

The Neapolitan keeps no private stores on hand, nor is provision made for more than a single day. Thus, after the hour of dining, even in houses of the wealthy, little else than bread and macaroni will be found.

Most Neapolitan families employ male cooks, who purchase all provisions, and it is not considered advisable to allow them more than the limited sum of money necessary for each day's supply. Every morning the cook provides a stock for the day of meat, fish, vegetables, fruit, and milk. Butter is brought to customers in pails of fresh water. Since the spring of 1885 Naples obtains an immense quantity of the purest water from the Apennines, which is always quite cold, even during the hottest part of the summer.

As Italians prefer olive-oil in cookery to butter, the latter is only bought for table use, and not kept on hand in any quantities.

Butchers, restaurants, wine merchants, fish venders, and dealers in petroleum have grottoes in which to preserve their wares. Tufa rocks extend along the entire north and west of the city of Naples at an elevation of from four to seven hundred feet. Innumerable grottoes have been cut into these rocks, for the double purpose of obtaining the tufa stone for building purposes and of using the grottoes for cellars and store-rooms. The best of these are reached through long tunnels or passages, ending frequently in immense caverns.

The object of the long passage is to exclude outside air. The annual rent of such a grotto or cave is from 150 to 200 francs.

During the summer months comparatively little meat is consumed in this climate, the poorer classes living exclusively on bread, vegetables, macaroni, and fruit. Butcher-shops during that part of the year are only open in the forenoon. The meat remaining unsold at noon is returned to the grotto until next day. Meat inspectors daily visit the butcher-shops and confiscate all tainted meat.

It is extremely difficult to introduce new inventions among a people who use tools and farming utensils which are fac similes of those excavated at Pompeii and Herculaneum, exhibited in the museum at Naples.

The municipal authorities of the city of Naples for the consideration of 200,000 lire per annum have granted to the "Societa delle Neviere" the monopoly or exclusive right to sell snow or ice in the city of Naples.

This society manufactures ice to a very limited extent, but sells large quantities of snow collected on the Apennines, which is preferred by the people here. The *modus operandi* of procuring snow is as follows: During the coldest part of the winter holes are dug on the mountains at an elevation of about 2,500 or 3,000 feet above the level of the sea. These holes are filled with snow, packed down as solid as possible and covered with the leaves of the chestnut tree to a sufficient height to protect the snow against rain, etc. From these holes the snow is packed in straw mats or baskets, transported on mules or donkeys to the nearest railroad station, and thence to the cities. The supply for Naples is brought from Monte San Angelo, about 16 miles from Naples.

The Societa delle Neviere had to enter into a bond in the amount of 100,000 lire for the true performance of their agreement. They are obliged to have at all times a sufficient quantity of ice and snow on hand in their warehouse or cellar at Naples, and supply purchasers at the rate of lire 4.55 per 100 pounds (lire 10 per 100 kilo). Retailers are allowed to sell snow or ice obtained from the society at the rate of 9 centimes per pound.

EDWARD CAMPHAUSEN,
Consul.

UNITED STATES CONSULATE,
Naples, January 21, 1890.

VENICE.

REPORT BY CONSUL JOHNSON.

The refrigerator as a piece of household furniture has been, until very recently, almost unheard of in this consular district, and is at present far from being in general use. Where foods and liquids have been preserved for any length of time, such as in most of the hotels, butcher shops, and breweries, the most primitive methods of preservation by packing directly in ice have been practiced, and no attempt has been made to economize in the use of ice in such cases.

The people in general use very little ice, and rarely keep perishable foods and liquids in their houses in sufficient quantities to necessitate their preservation for any length of time.

I am informed that in many of the towns of this consular district ice-houses exist, belonging to the communal authorities, or in some cases

to private companies, and in these the butchers of the town can keep their meats, each one by the payment of a small tax, reserving a space in the ice-house for his exclusive use.

In the construction of refrigerators for this consular district no peculiar features are required.

The only manufactory of refrigerators to be found in this district is in the city of Venice, having been started about a year ago by a firm of Germans, the Herion Brothers, who are engaged in various commercial enterprises in this city and who are going into the manufacture of refrigerators as an experimental operation. The specimens I have examined are of simple construction, the wood used being American pitch pine, and the makers claiming that they are made after the latest system in use in Germany.

Ice is secured in the winter from ice-ponds, streams, and bodies of fresh water on the mainland (in the case of Venice) near Mestre, stored in ice-houses, and brought to Venice during the summer in boats, the price of ice per 100 pounds being on an average 45 cents.

Outside of those refrigerators made by Herion Brothers there are to be found in Venice a very limited number of refrigerators of German make and these sell at prices slightly higher than those of domestic make, but as the sale of refrigerators generally speaking is so restricted, the greater part of the merchants here do not care to risk importing them.

The best manner of introducing the American refrigerator would be to have samples at the shops of the principal dealers in the important towns of this district, as Venice, Verona, Treviso, etc., bearing in mind that the chief requisite for a ready sale and general popularity is a diminutive price, as high-priced goods would be absolutely unsalable here no matter what superior qualities the article might possess.

H. ABERT JOHNSON,
Consul.

UNITED STATES CONSULATE,
Venice, July 12, 1890.

RUSSIA.

REPORT BY CONSUL-GENERAL CRAWFORD, OF ST PETERSBURG.

Refrigerators are little known here; they are exclusively used at restaurants and shops as yet. Many houses in this city have ice-cellars in which is stored the ice necessary for the season. Artificial ice is unknown here.

On inquiry I have learned that refrigerators are considerably used in the western and southern provinces; but these refrigerators in no way compare in excellence with those of American manufacture.

In my opinion there is a large and lucrative field in Russia for this industry, and American firms would do well to open it up and work it.

J. M. CRAWFORD,
Consul-General.

UNITED STATES CONSULATE GENERAL.
St. Petersburg, January 25, 1890.

FINLAND.

REPORT BY VICE-CONSUL DONNER, OF HELSINGFORS.

There are no refrigerators in use in this country.

The railway carriages used for the transport of butter, etc., are kept cool in summer by putting ice in an iron cylinder, about 2 feet in diameter, which is placed horizontally across the carriage inside. Steamers use small ice-safes for the purpose of preserving the food during the voyage.

Any one who chooses may take ice from the sea or the lakes in Finland, so that the cost is only that of the labor employed.

As there is at the present time increasing attention given to the export of butter, etc., from this country, I think if I could be furnished with specifications of smaller and larger refrigerators, together with the prices delivered here, there might be a good opening for their introduction into Finland. If the manufacturers would like to send samples of the machine they should be forwarded by the Wilson line from New York, via Hull, to Helsingfors.

HERMAN DONNER,
Vice and Acting Consul.

UNITED STATES CONSULATE,
Helsingfors, January 14, 1890.

POLAND.

REPORT BY CONSUL RAWICZ, OF WARSAW.

Refrigerators for the preservation of foods and liquids are extensively used in this consular district. The refrigerators are constructed in such sizes and shapes as suit the house furnitures of different classes of the population of this country. As I was informed, it is a fact that all refrigerators now in use in Poland are exclusively manufactured in the city of Warsaw, from whence they are also exported to the Russian western governments.

The ice is usually secured in the winter season, during which both ice dealers and brewers supply themselves with the necessary quantity of ice drawn either from the Vistula River or from the neighboring ponds. Its price depends on the season and ranges from 10 to 15 cents per 100 pounds.

The American system of refrigerators can be introduced here and compete with the local one if it will prove cheaper and more convenient.

JOSEPH RAWICZ,
Consul.

UNITED STATES CONSULATE,
Warsaw, January 21, 1890.

SPAIN.

BARCELONA.

REPORT BY CONSUL SCHEUCH.

Refrigerators are virtually not in use in Barcelona, Catalonia, or the Balearic Islands, and as all food and necessaries of life are strictly bought fresh from day to day, I think refrigerators will not be appreciated for many years as they are in other European countries. Private families never use ice at home, excepting the few English and German families. I remember Mess. Ros y Ca of this city, then dealers in American goods, imported some five years ago six refrigerators, and after two years' unsuccessful efforts sold them to several foreign families at ruinous prices, losing duty, freight, insurance, etc.

The restaurants, coffee-houses, saloons, and hotels receive daily during the summer quantities of ice-snow gathered in the neighboring hills, placing it in their cellars. This sort of ice is cheap, often dirty, but suits all their purposes, selling at $1.50 per 100 pounds. Some years ago a Norwegian house here brought a cargo of fine ice from Norway and lost heavily. The snow-ice gathered in the hills is placed in deep ice-wells, and brought in summer daily in carts to the city. Two years ago an artificial ice factory was started, but, as already stated, the Catalonians using no ice at home, this factory depends entirely on hotels, restaurants, etc., doing little business on account of the cheapness of the snow ice, the city tax on manufactured ice being high.

My opinion is the introduction of refrigerators will be very difficult in this district, as it will take years to convince the people at large of their great utility.

FREDK. H. SCHEUCH,
Consul.

UNITED STATES CONSULATE,
Barcelona, January 26, 1890.

CARTHAGENA.

REPORT BY CONSUL MOLINA.

There are no refrigerators used in my consular district. The people are not accustomed to preserving food.

We use artificial ice, and this is simply used in summer drinks. The price of ice is about $2 per 100 pounds.

C. MOLINA,
Consul.

UNITED STATES CONSULATE,
Carthagena, January 31, 1890.

GRAO OF VALENCIA.

REPORT BY CONSULAR AGENT MERTENS.

American refrigerators are not known here. A few years ago a German house sent here a few refrigerators, which were sold after some time at half their cost price. They did not please the buyers, because there was no economy of ice in their use.

The ice used here is artificial, and its manufacture is not of a superior kind, the ice being too soft. Besides this, the snow which falls during winter time on the surrounding mountains is gathered in and stored in rice husks.

There is not such a general use of ice here for preserving foods and liquids as in the United States, and the little which is used for refreshing the beverage at dinner time is generally sent after to the manufacturers.

Restaurants and hotels keep their daily need of ice preserved in a heap of rice husks in the cellar or a cool place of the house.

My opinion is that even a very plain and economical kind of refrigerator would find difficulty in selling here, as there is little desire amongst the natives of this place to spend money for household improvements, and the number of foreigners is very small. The latter, however, possess this article, imported mostly from Germany.

THEODOR MERTENS,
Consular Agent.

UNITED STATES CONSULAR AGENCY,
Grao of Valencia, January 8; 1890.

CADIZ.

REPORT BY CONSUL TURNER.

Replying to Department circular regarding refrigerators, I have the honor to inclose herewith replies to same from the consular agents at Jeres de la Frontera, Seville, and Port St. Mary's. I can add but little to what these inclosures contain. Ice sells here at 5 cents per pound to small consumers, and is used in sparing quantities, except in the manufacture of iced drinks, etc.

Fresh meat during the summer is obtainable only in the morning. It is prepared for market during the night, and every butcher expects to dispose of his entire stock before the following noon.

The first and only cargo of ice ever landed here from abroad came from Boston in 1856. It arrived in June, and was not discharged for several weeks on account of the stupidity of the custom officers, who insisted that it must be landed on the docks in a burning sun and weighed as other cargo. This was prevented by the governor of the

province, who interfered in behalf of the shippers. It was the first ice ever seen by many people and attracted large crowds.

Regarding the introduction of American methods of preserving fruits, vegetables, meats, etc., I must differ from Mr. Hall, for living must always be high here so long as the hand to mouth process to which he refers continues. The abundance of prosperous years is wasted for lack of methods of preservation. The distress following partial or total failure of crops is always doubly great because the excess of fruitful years has not been preserved. In this land of fruit peaches sell for 20 cents per pound, the dried article for 35 cents. Green apples and pears sell for 15 cents per pound. Preserved fruits are hardly known.

It is difficult to tell how our goods and methods can be introduced when there is no such thing as an American doing business here. All these things would naturally and rapidly introduce themselves were this country traversed by salesmen representing American merchants and American goods. In the absence of such a force, and in the absence also of a direct trade in breadstuffs, canned meats, vegetables, fruits, etc., between this country and the United States, I see no method of bringing about the desired results, if it is not done by private enterprise. I believe it would pay our farmers if the Department of Agriculture would demonstrate the cheapness and purity of our canned goods and the uses of Indian maize at Spanish fairs. In closing I might add that the expressed observations of all American travelers that I have had the pleasure of meeting since coming to Cadiz are in harmony with everything that has been written in favor of trade with this country.

The high prices of all kinds of food supplies surprise all.

I am informed by the captain of the American bark *Kennard*, which trades regularly between Boston and Fayal, that Cadiz is a much better point than Fayal for trade, and he proposes changing accordingly. He has posted himself on prices while here for future use.

R. W. TURNER,
Consul.

UNITED STATES CONSULATE,
Cadiz, January 29, 1890.

JEREZ DE LA FRONTERA.

REPORT BY CONSULAR AGENT HALL.

[Inclosure 1 in Consul Turner's Report.]

Refrigerators.—In this district I consider myself as authorized in saying that refrigerators are not only unknown but that they are unnecessary, owing to the simplicity of the Spanish cuisine.

Spanish families, high and low, make their market purchase daily, and only in such quantities as shall be necessary for the consumption or use of the day.

It is doubtful whether in any family, no matter what its social standing is, such a thing as a roast of veal, leg of mutton or pork, or a fowl would be found from one day to another. Pies, cakes, custards, etc., are unknown culinary luxuries.

I am confident there is no opening for the introduction of refrigerators in this district.

Preserving foods and liquids.—This is completely unknown in all senses. A long residence in this country warrants me in affirming that preserving fruits, fowls, meats, fish, etc., is only done by the use of spirits of wine for fruit, and oil and lard for the other articles mentioned.

Ice.—This article, manufactured in Seville, is only used during the summer, when it is used for making ice creams, etc. It wholesales in this city at $2 per hundred weight, and retails at from 3 to 5 cents per pound.

SEVILLE.

REPORT BY CONSULAR AGENT CALDWELL.

[Inclosure 2 in Consul Turner's Report.]

Refrigerators are not used here. Ice is manufactured here, and sells in summer for 7½ pesetas per 100 pounds and in winter for 14 pesetas per cwt. Food is bought from day to day. I think there is no opening for American refrigerators.

PORT ST. MARY'S.

REPORT BY CONSULAR AGENT DANIELS.

[Inclosure 3 in Consul Turner's Report.]

Referring to the refrigerator circular you sent me a few days ago, I regret to say that, after making all possible inquiries, I am unable to give answers to its questions, for I find that refrigerators are not used, or even known, here. The very small consumption of ice is provided for by supplies from Seville, the price of which I am unable to give, for it is only used during the summer months. It is used only for iced drinks, and the price varies.

MALAGA.

REPORT BY CONSUL MARSTON.

Refrigerators are not used in this part of Spain.

The ice used in Malaga is artificial, and only to be had from May until October, and very little is used, except in cases of illness. Spaniards never drink ice water as in the United States. There are two ice

factories in the city of Malaga. A single kilo costs 1½ reais (about 7½ cents), or you can purchase a package of ice tickets of 30 tickets each at the following prices, viz: 30 tickets of 1 kilo each, $1.64; 30 tickets of 2 kilos each, $3.08; 30 tickets of 3 kilos each, $4.53; 30 tickets of 6 kilos each, $8.88; 30 tickets of 10 kilos each, $14.47. The above is delivered at your door at any regular hour you may state. The manner of living here does not require the use of either ice or refrigerators. There are no milk cans, consequently no butter is made in this part of Spain. All butter is imported in cans, mostly from Ireland or Copenhagen. The milk used is goat's milk, these goats being driven from door to door in the early hours of the morning, the servants purchasing what each family requires. The cook goes to market every morning and makes her purchases for the day. Meat is but little used, even by the well-to-do, hardly ever by the middle classes, and it is a rare occasion when the poor ever taste it, bread, fish, and vegetables being the principal diet. In Malaga the fish is the very best, and it can be bought at any hour of the day, passing your door, fresh from the Mediterranean, at a very small cost, and is never purchased until required for cooking. This state of things dispenses with the necessity of all classes of refrigerators, for none could be sold here.

H. C. MARSTON,
Consul.

UNITED STATES CONSULATE,
Malaga, January 20, 1890.

GIBRALTAR.

REPORT BY CONSUL SPRAGUE.

Refrigerators are very little used in this city.

The very few in use possess no peculiar features, either in construction or application.

Those in use are generally of English manufacture.

Ice is manufactured at the north front, outside the gates of this garrison, from rain-water, and is sold at about $3 per 112 pounds, but can be obtained much cheaper if regularly taken in larger quantities.

Provisions and liquids are generally kept in underground cellars and stores during the summer months, so that refrigerators are not in any demand.

HORATIO J. SPRAGUE,
Consul.

UNITED STATES CONSULATE,
Gibraltar, *January* 14, 1890.

SWEDEN.

GOTHENBURG.

REPORT BY CONSUL MAN.

Refrigerators are not nearly so extensively used here as in the United States but are nevertheless quite generally found in the city and country houses of the middle and upper classes.

There are no peculiar features required in the construction of refrigerators for this district.

They are manufactured at so called "mechanical workshops" which are extensive concerns, engaged in the manufacture of a large line of articles composed more or less of metal, and embracing all varieties of kitchen utensils, stoves, farming implements, plumbers' materials, tools, machinery, etc., even constructing steam-ships and armored war vessels.

The general dimensions of the refrigerators in use here are confined to three sizes, the smallest being 2½ feet square; the middle and most used 2½ feet front width, 2½ feet side width, and 3 feet in height; the largest 2½ feet front width, 2½ feet side width, and 4 feet in height.

These consist simply of a zinc-lined wooden box protected by an intermediate non-conductor furnished with a door in front, a lid on top, and several galvanized wire racks, the ice being nearly at the bottom of the chest, while the racks are above it.

The prices for these three sizes at retail are, respectively, $8.58, $9.38, and $12.06.

Ice is cut from the lakes and rivers by the brewers, and supplied by them to the public at an average price of 37 cents a hundred pounds.

As to the best method of introducing them into this country I am of the opinion that the only advisable way would be through energetic agents, who, by convincing the people of the superior qualities of the American refrigerator, could find a market for them here, notwithstanding the low prices of the Swedish article, and the fact of the strong disinclination of the people to adopt new methods at a greater outlay.

ERNEST A. MAN,
Consul.

UNITED STATES CONSULATE,
Gothenburg, February 14, 1890.

STOCKHOLM.

REPORT BY CONSUL ELFWING.

I have not been able to find the use of any refrigerators anywhere in Sweden, nor do I believe that the introduction of them there could meet with success. Ice in this cold climate is a very cheap and hardy article; it is sold at retail here in Stockholm, delivered in the houses, at about 40 cents per 100 pounds. Breweries and like establishments which use much take up their own quantities and pay, of course, much less. There is never any warm or hot weather; perhaps for a couple of weeks in July or August it is hot, and nothing is therefore done for the preservation of food and liquids.

NERE A. ELFWING,
Consul.

UNITED STATES CONSULATE,
Stockholm, January 28, 1890.

SWITZERLAND.

HORGEN.

REPORT BY CONSUL ADAMS.

In the forest and mountain cantons, which occupy nearly the whole of this district, the refrigerator is an article hardly needed or known. The altitude of the region and the vicinity of perpetual ice and snow keep the temperature down, except in midsummer during the day-time, while for the leading industries of the country, lumbering and cattle-raising, temperature is almost a matter of indifference. So far as I can learn it is only in the large dairies (butter and cheese factories) that artificial refrigeration is employed. In these the chamber for storing milk, as it is delivered by the neighboring herdsmen, is converted into a refrigerator by cementing the floor and the walls for a foot or more above the floor, and introducing flowing water from the nearest brook. The milk, placed in shallow wooden (usually ash) vessels, is surrounded by the water. As water is supplied in abundance by the melting snows and ice, at the cost of a little ditching and piping, the system is not likely to be superseded. It is only in the valleys and lowlands, where the conditions are different, that the questions of the circular apply.

In this lower region, refrigerators are in common use, especially in the towns where they are to be found in nearly all the larger hotels, boarding houses, restaurants, and hospitals, in the shops of butchers, poulterers, fishmongers, and pastry cooks, in many public institutions and private families. In the country the large dairies use them in place of the mountain system, but not the farmers, who now deliver all their milk to the dairies.

The butchers use a refrigerator of large dimensions, with an outer case of stone or cement, and an inner one of wood lined with zinc. In others in use there seem to be no peculiar features of construction.

Most of the refrigerators in this district are of local manufacture. Perhaps 10 per cent. come from Germany or Holland.

The sizes vary from 1 by 1 by 1 meter to 5 by $1\frac{1}{2}$ by $1\frac{1}{2}$ meters. They usually consist of an inner case, zinc-lined, separated by a packing of sawdust or pulverized charcoal from the outer case. The ice-box is

filled from the top, and fitted with drain-pipe and tap. The following table gives details:

Refrigerators used by—	Dimensions in meters.	Prices.
Dairies	1 to 1½ by 1 by 1	$14 to $23
Butchers	5 by 1 by 1	75 100
Poulterers		15 30
Hotels	3½ to 5 by 1¼ by 1 to 1½	96 150
Pensions	1 to 2 by 1 by 1	15 96
Pastry cooks	1 to 2 by 1 by 1	15 40

The dairies use 2, or more; the butcher 1; poulterers 1 to 3; hotels 3 to 5; other establishments usually 1.

Ice, supplied by the lakes and ponds, usually not of the best quality, is abundant in summer at 40 cents per 100 pounds retail, and $1.93 per wagon-load wholesale.

Finally, as to the readiness of the people to adopt the American system of preserving foods and liquids, as much would depend on the economy as on the superiority of the system. A market might be found, at least in the larger Swiss towns, for the American article if it could be shown by actual trial to be more efficient than the local article at the same cost, or equally efficient at a less cost. It would be well, perhaps, for manufacturers to communicate with the leading hotels of the country, whose managers are more attentive to matters of this sort than any other class interested. None of the dealers in American goods here import direct. The general importers at Basle or Geneva might be induced to do so.

LYELL T. ADAMS,
Consul.

UNITED STATES CONSULATE,
Horgen, January 30, 1890.

ZURICH.

REPORT BY CONSUL CATLIN.

Refrigerators are extensively used in this consular district. Their sizes and formations are extremely varied in character. So far as I have been able to learn, none of them possess any peculiar features not known to manufacturers elsewhere. A large number of those in use are manufactured in Switzerland—there are two factories here in Zurich, and many are made by individual joiners—but in this, as in everything else, German competition is overwhelmingly strong, and the Swiss makers have all they can do to stem the tide and keep up their prices to paying rates. I have heard of an English refrigerator having been imported hither, but it does not seem to have elicited further orders of the same kind. The Swiss and German articles control the market.

Owing to the number of beer saloons, both large and small, and the necessity of keeping and serving the beer cool during warm weather,

the number of refrigerators of a medium size in actual use is much larger than it would be in a non-beer-drinking community of the same population. Refrigerators are also used by the hotels, great and small, boarding-houses, restaurants, butchers, confectioners, apothecaries, hospitals, and to a limited extent in private families.

In size and formation, as above stated, they greatly vary. I give herewith a description of a number of those here offered for sale:

No. 1.—Ice chamber on top. Refrigerator divided into three compartments, viz, (1) with room for two kegs of beer of 100 liters each, one being on draught while the other is cooling; (2, middle) for keeping raw meats in large pieces, game, poultry, and fish; (3) for cooling food, bottles, and glasses; outer measurements, side compartments (1 and 3) 1.65 meters long, .85 wide, 1.75 high; middle compartment (2) 1.53 meters long, .90 wide, 2.40 high; price only obtainable by purchase.

No. 2.—Ice chamber on top. Refrigerator has room for 10 kegs of beer of 80 liters each, 2 of them on draft while the rest are cooling; also room for food, bottles, and glasses. Takes 2,000 pounds ice. Length 4.50, width 1.29, height 2.25 meters.

No. 3.—Ice chamber on top and sides. Has room for 4 wine jugs of 18 liters each, and 2 kegs of beer of 50 liters each on draft; also 3 spaces for glasses, bottles, and food. Takes 600 pounds ice. Length 3.21, width .87, height 1.59 meters.

No. 4.—Desk form. Cushioned doors, if desired. Ice chamber on top. Has two compartments, for keeping raw meat, game, poultry, and fish cool. Takes 640 pounds ice. Length 1.85, width .92, height 1.61 meters.

No. 5.—Secretary form. Ice in center, for cooling all kinds of food and bottled liquids. Made in five sizes.

	Length.	Width.	Height.	Ice.		Length.	Width.	Height.	Ice.
	Meters.	*Meters.*	*Meters.*	*Pounds.*		*Meters.*	*Meters.*	*Meters.*	*Pounds.*
A	0.96	0.63	1.08	90	D	1.80	0.78	1.80	280
B	1.29	0.69	1.38	160	E	1.90	0.85	1.98	340
C	1.47	0.78	1.68	240					

No. 6.—Sideboard form. Ice chamber above; contains four separate compartments for preserving cooked food and liquids of all kinds on marble slabs; is finished in oak, is similarly decorated on both sides, and can be placed in the center of a dining-room. Takes 300 pounds ice. Length 2.71, width .76, height 1.04 meters. Marble slabs extra.

No. 7.—Sideboard form for smaller hotels, restaurants, boarding-houses, and large families. Ice-chamber above. Takes 130 pounds ice. Length 1.03, width .88 (below), .63 (above), height 2.16 meters.

No. 8.—Ice chamber above. Contains two separate compartments. Length 1.28, width .68, height 1.69 meters. Takes 140 pounds ice.

No. 9.—Bureau form. Ice-chamber in upper center. Length 1.32, width .68, height 1.32 meters. Takes 100 pounds ice.

No. 10.—For small families. Ice-chamber at side.

	Length.	Width.	Height.	Ice.		Length.	Width.	Height.	Ice.
	Meters.	*Meters.*	*Meters.*	*Pounds.*		*Meters.*	*Meters.*	*Meters.*	*Pounds.*
A	1.02	0.65	0.84	60	B	1.21	0.76	1.00	110

No. 11.—For small families. Ice chamber below.

	Length.	Width.	Height.	Ice.		Length.	Width.	Height.	Ice.
	Meters.	*Meters.*	*Meters.*	*Pounds.*		*Meters.*	*Meters.*	*Meters.*	*Pounds.*
A.	0.70	0.52	0.65	30	C.	1.40	0.76	0.94	110
B.	0.98	0.65	0.84	60					

No. 12.—For same. Ice chamber above. One compartment. Length .87, width .71, height 1.52 meters. Takes 110 pounds ice.

No. 13.—For apothecaries, doctors, and hospitals. Bureau form. Ice chamber at side. Length 1, width .60, height 1 meter. Takes 150 pounds ice.

No. 14.—For cooling bottles or preserving victuals. Ice chamber above. Finished as a piece of furniture with double front. Length 1.15, width .75, height 1.15 meters. Takes 140 pounds of ice.

No. 15.—Ice chamber in center. Has four separate compartments for preserving foods and liquids. Length 1.38, width .67, height 1.01 meters. Takes 80 pounds ice.

No. 16.—Desk form. For butchers and sausage-makers. Ice chamber below. Has two separate compartments. Length 1.85, width .76, height 1.05 meters. Takes 200 pounds ice.

No. 17.—Desk form. For same. Ice chamber below. Length 1.36, width .72, height 1.05 meters. Takes 160 pounds ice.

No. 18.—For cooling beer. Ice chamber above. Holds four kegs of beer, two on draught while the others are cooling. In three sizes, according to size of kegs, viz:

	Kegs.	Length.	Width.	Height.	Ice.		Kegs.	Length.	Width.	Height.	Ice.
	Liters.	*Meters.*	*Meters.*	*Meters.*	*Pounds.*		*Liters.*	*Meters.*	*Meters.*	*Meters.*	*Pounds.*
A.	60–70	1.60	0.93	2.30	700	C.	20–30	1.00	0.70	1.08	280
B.	40–50	1.30	0.80	2.00	400						

No. 18.—For cooling beer. Ice chamber on side.

	Kegs.	Length.	Width.	Height.	Ice.		Kegs.	Length.	Width.	Height.	Ice.
	Liters.	*Meters.*	*Meters.*	*Meters.*	*Pounds.*		*Liters.*	*Meters.*	*Meters.*	*Meters.*	*Pounds.*
A.	60–70	1.96	0.93	1.93	600	C.	20–30	1.30	0.70	1.50	220
B.	40–50	1.60	0.80	1.70	500						

No. 20.—For cooling beer. Ice chamber above. Holds two kegs of beer on draught.

	Kegs.	Length.	Width.	Height.	Ice.		Kegs.	Length.	Width.	Height.	Ice.
	Liters.	*Meters.*	*Meters.*	*Meters.*	*Pounds.*		*Liters.*	*Meters.*	*Meters.*	*Meters.*	*Pounds.*
A.	60–70	1.45	0.93	1.70	400	C.	20–30	1.30	0.70	1.40	300
B.	40–50	1.45	0.80	1.55	320						

No. 21.—For cooling beer. Ice chamber above. Holds one keg on draught, with space for keeping food, bottles, etc.

	Kegs.	Length.	Width.	Height.	Ice.		Kegs.	Length.	Width.	Height.	Ice.
	Liters.	*Meters.*	*Meters.*	*Meters.*	*Pounds.*		*Liters.*	*Meters.*	*Meters.*	*Meters.*	*Pounds.*
A.....	60-70	1.45	0.93	1.70	300	C....	20-30	1.05	0.70	1.45	160
B.....	40-50	1.30	0.80	1.56	220						

No. 22.—For cooling beer. Ice chamber on side. Holds one keg beer with low pressure.

	Kegs.	Length.	Width.	Height.	Ice.		Kegs.	Length.	Width.	Height.	Ice.
	Liters.	*Meters.*	*Meters.*	*Meters.*	*Pounds.*		*Liters.*	*Meters.*	*Meters.*	*Meters.*	*Pounds.*
A.....	60-70	1.25	0.78	1.05	200	C....	20-30	1.04	0.56	0.75	1.30
B.....	40-50	1.10	0.65	1.90	160						

No. 23.—For cooling beer. Ice chamber on side. Holds one keg beer with low pressure.

	Kegs.	Length.	Width.	Height.	Ice.		Kegs.	Length.	Width.	Height.	Ice.
	Liters.	*Meters.*	*Meters.*	*Meters.*	*Pounds.*		*Liters.*	*Meters.*	*Meters.*	*Meters.*	*Pounds.*
A.....	60-70	1.30	0.93	1.45	220	C....	20-30	1.00	0.70	1.20	90
B.....	40-50	1.15	0.80	1.30	150						

No. 24.—Washstand form, with faucets. Ice chamber on side. For keeping four different kinds of beer on draught and cooling drinking water. Length, 0.80; width, 0.70; height, 0.75 meters. Takes 260 pounds ice.

No. 25.—For confectioners and pastry cooks. Ice chamber in center. Has two compartments for preserving and cooling unbaked dough, eggs, butter, cream, etc. Length, 1.50; width, 0.81; height, 0.87 meters. Takes 140 pounds ice.

Ice boxes for keeping raw ice are made in various sizes, viz:

	Length.	Width.	Height.	Ice.		Length.	Width.	Height.	Ice.
	Meters.	*Meters.*	*Meters.*	*Pounds.*		*Meters.*	*Meters.*	*Meters.*	*Pounds.*
A............	0.84	0.84	0.96	200	G...........	1.29	1.29	1.41	1,400
B............	0.96	0.96	1.08	400	H...........	1.33	1.33	1.45	1,600
C............	1.05	1.05	1.17	600	I...........	1.38	1.38	1.50	1,800
D............	1.14	1.14	1.26	800	K...........	1.41	1.41	1.53	2,000
E............	1.20	1.20	1.32	1,000	L...........	1.44	1.44	1.56	2,200
F............	1.24	1.24	1.36	1,200	M...........	1.47	1.47	1.59	2,400

The various sizes and formations here described—it is impossible to obtain the prices in any case without actually purchasing—will enable our American manufacturers to form a fair idea of the demands of the trade in this section.

Ice sells at from 18 to 24 cents per 100 pounds when delivered in large quantities and at from from 30 to 40 cents in smaller lots. It is obtained from the neighboring lakes—the Greifensee, the Katzensee, and other smaller bodies of water. The Klönthalersee, in the neighboring canton of Glarus, freezes over every winter. The glaciers are also made, in Canton Wallis, tributary to the demand which, of late years, owing to the growth of the Swiss beer-brewing industry, has become enormous. The four hundred breweries in Switzerland alone

consume 100,000 tons annually, at an expense, including freight and labor, of 500,000 francs. The manufacture of artificial ice has consequently greatly developed, there being two firms in this city and one at Geneva engaged in the business.

For the introduction of American refrigerators into this district a sharp, pushing agent, provided with a full line of samples and speaking the German language thoroughly, would be the first requisite. The appointment of a local agent here would hardly suffice; he must be a man thoroughly conversant with the American trade and manufacture, and should be sent out for that purpose. Even then his success would depend entirely on whether he could compete in prices with the local and German manufacturers. The former have no freight or entry duties to pay; the latter, too, are near by, and, spite of the duties, can, it seems, deliver their goods here at competing prices. But when the freight from New York to Zurich, plus the entry duties, come to be added to the original price of an American refrigerator, be its merits what they may, it will require a sharp and tireless salesman here to overcome the local competition and make the sale of the American article a paying one in this remote inland market.

GEORGE L. CATLIN,
Consul.

UNITED STATES CONSULATE,
Zurich, January 23, 1890.

TURKEY.

REPORT BY CONSUL-GENERAL SWEENEY, OF CONSTANTINOPLE.

Refrigerators are not used in this consular district, except in a very few houses or hotels. The refrigerators in use are of European or local make; and should any American refrigerators be introduced into this district they should cost very little. People in this country, however, as a general rule, have a very primitive way of preserving foods and liquids by keeping them in subterranean caves or cellars. The best manner of introducing refrigerators in this district is by continued advertisement on a very extended scale, both in all the newspapers published in this city and in all conspicuous places, such as hotels, beer establishments, clubs, etc.

Ice is secured in this district by manufacture by a company which obtained an imperial concession for the exclusive manufacture of this useful article. The factory is situated at Stenia, one of the villages on the European side of the Bosphorus. The use of ice is rather limited in this country, as heretofore it was secured only from its natural sources; but it is increasing gradually. The price per 100 pounds of ice is $1.

In conclusion I beg to remark that this district may adopt the American refrigerators if they can be manufactured in such a way as to sell very cheaply.

Z. T. SWEENEY,
Consul-General.

UNITED STATES CONSULATE,
Constantinople, January 14, 1890.

THE UNITED KINGDOM.

ENGLAND.

BIRMINGHAM.

REPORT BY CONSUL JARRETT.

Refrigerators are used in this consular district chiefly by butchers and fishmongers and at hotels and large restaurants. By private families, so far as I can find, they are used to a very limited extent only.

There are no peculiar features required in the construction of refrigerators so as to adapt them for use in this country. Those now in use in large establishments are very similar in construction to American refrigerators, but though the general features of smaller refrigerators adapted for family use are similar to those of American make, there is a marked difference in their construction, the American being better in design and utility. I may add that the price of American refrigerators is lower than the price of similar ones of English make.

The large fixed refrigerators for preserving perishable food are manufactured in this consular district. Those for the brewery purposes are manufactured in Burton-on-Trent. Small refrigerators for family use are not manufactured here. The principal of this class of refrigerators in this country are of Manchester make.

The ice used in this consular district is all manufactured, being the product of the Linde British Refrigeration Company, a concern that not only manufactures ice for consumption in England, but also on the Continent. Natural ice is imported into this country at London and Hull, from Norway. Last year it was about 200,000 tons at London and about 75,000 tons at Hull. The price of ice a short time ago was very low, being about $1.93 per ton. A consolidation of the different concerns then existing was effected, when the price of ice was considerably advanced. Mr. G. H. Jackson, of the Linde British Refrigeration Company, limited, has kindly furnished me with the following present selling price of ice:

	Per ton.*
Birmingham	$7.29
London	4.38 to 7.29
Grimsby and Hull	4.86½
Cardiff	6.08
Liverpool	4.38 to 7.29

The concern that does the largest business in the sale of refrigerators in this city is that of Evans & Matthews. Their sales amount to

*2,240 pounds.

about two hundred and sixty in each year. The manager informs me that the sales of Mr. Kent, of London, will not exceed sixty per week during the summer season.

Should the American manufacturers conclude to introduce their refrigerators into this district, I can not suggest any better means than that they do so through Evans & Matthews, as I know it to be the most reliable house doing business in that line in the Midlands. I may say, in conclusion, that the climate of this country is not the most favorable to insure the general use of refrigerators. The temperature rarely exceeds 85° Fahrenheit. Warm periods of long duration seldom take place. This probably accounts for the fact that refrigerators have not been adopted into general family use, even by persons of fair means.

JOHN JARRETT,
Consul.

UNITED STATES CONSULATE,
Birmingham, January 28, 1890.

BRADFORD.

REPORT BY CONSUL TIBBITS.

Refrigerators are used in this consular district, but only to a comparatively limited extent. Their use is mainly confined to hotels, and the better class restaurants, eating-houses, and fish and game markets. They are found in but few private residences, and only in those of the wealthy class. Regarded as household necessities in the United States, they are here considered articles of luxury. In the town of Bradford, with a population of nearly 250,000, there are but two firms that deal in refrigerators, and inquiries made of them disclose the fact that their combined annual sales will not average more than 6 dozen.

No particular features are required in the construction of refrigerators adapted for use in this district.

The refrigerators in use in this district are manufactured in the United States and by a single firm in London. The American refrigerator principally in use is that known as the "Alaska."

The sizes of refrigerators kept in stock by local dealers are as follows:

	Width.	Depth.	Height.	Price.		Width.	Depth.	Height.	Price.
	Inches.	*Inches.*	*Inches.*	£ s.		*Inches.*	*Inches.*	*Inches.*	£ s.
No. 2....	27	21	30	4 4	No. 4..	39	24	32	6 6
No. 3 ..	33	22	31	5 5	No. 6...	50	27	34	8 8

The ice here in use is imported from Norway. The price per 100 pounds varies from 3 to 5 shillings, the former rate being charged when delivery is at the place of sale, and the latter when it is at the premises of the purchaser. The retail price is 3 pence per pound.

Where refrigerators are not in use, foods and liquids are preserved in cellars, and the temperature is rarely high enough to cause any difficulty to be experienced.

The American refrigerators, as at present constructed, met all local requirements in this district and are, according to the statements of the local dealers, considered superior to those of home manufacture.

Taking into consideration the climatic conditions that here prevail, and the high price which ice must always command owing to the lack of any home product, there is but little room for any substantial extension of trade by American manufacturers of refrigerators in this consular district.

JOHN A. TIBBITS,
Consul.

UNITED STATES CONSULATE,
Bradford, January 21, 1890.

BRISTOL.

REPORT BY CONSUL DELILLE.

The use of refrigerators is extending in Bristol. To begin with the Bristol Dock Company, it is noteworthy that their refrigerating plant at Avonmouth is now extensive. There are, however, no peculiar features in the construction of these refrigerators. They were supplied by Messrs. Pontifex & Wood, Shoe Lane, London, England, and are on the ammonia principle, with brine circulation in the cold stores, the contract amount of heat to be eliminated per hour being 267,000 British thermal units; and the cost, inclusive of buildings and steam boilers, £2,288 ($11,134.55). In my opinion, an excellent opening is now offered for the introduction and sale of refrigerators of American manufacture throughout the Bristol and West of England district. One recent and noteworthy event confirms this view. The large firm of Messrs. Nelson & Son, meat importers, of London and Liverpool, have lately opened a branch establishment of their business in this port, and are now having constructed spacious buildings for the storage of meat. The refrigerators which they will use are of American manufacture, being named the "Hercules," and are supplied by a Chicago firm.

In Messrs. Nelson & Son's new Bristol meat-houses there will be five storage chambers of considerable dimensions. Eventually, the firm hope to receive their dead meat from South America by fast steamers plying direct to Bristol instead of London. Bristol would thus become the distributing center for the whole of the West of England, and indeed, thanks to the economy of time and money by this transit, this port may perhaps attain to the position of supplying London with frozen meat, instead of being supplied therefrom as at present. It will thus be seen that American refrigerator manufacturers might do well

to turn their attention to this part of the United Kingdom, especially as their machinery has been so favorably brought under public notice by Messrs. Nelson & Son's selection, as noted above, of the "Hercules" patent.

From special inquiries on the subject, I have reason to believe that soon there will be a large demand among the local butchers, fish-mongers, and Bristol trades-people generally, for the smaller sized refrigerators so extensively used in the United States. Up to now very inadequate methods of preserving foods and fluids have prevailed here among this class of people.

As to ice, the local supply is fairly abundant, being almost entirely in the hands of Messrs. Bigwood, fish and ice merchants, who import nearly all their ice from Norway. Very little is manufactured on the spot. The wholesale price is 30 shillings ($7.29) per ton.

JOHN D. DELILLE,
Consul.

UNITED STATES CONSULATE,
Bristol, February 14, 1890.

FALMOUTH.

REPORT BY CONSUL FOX.

The temperature here is very mild, and refrigerators are not required.

Butchers' meat, etc., which is not disposed of when fresh, is salted for use of ships.

The best way of introducing refrigerators in the west of England would be to exhibit them in the north and west of England and royal Cornwall agricultural shows.

HOWARD FOX,
Consul.

UNITED STATES CONSULATE,
Falmouth, February 17, 1890.

LEEDS.

REPORT BY CONSUL WIGFALL.

Inquiry addressed to house-furnishing firms in Leeds has elicited replies to the following effect.

One says:

> The trade you refer to is a very limited one with us, and appears to be very well met by the freezers we buy from the United States through factors.

The freezers referred to by this firm are presumably ice-cream freezers, and not refrigerators.

Another answer, concerning the extent to which refrigerators are used in this district gives for hotels and restaurants universally; public houses very little; private residences in town moderately; in country very little.

The leading confectioner and caterer in Leeds, who is constantly employed for private entertainments, and who would therefore naturally be conversant with such details among the well-to-do classes of the community, thinks, as a rule, in the houses which he knows, that refrigerators are not in use.

The impression derived by the writer himself from personal observation is quite in accord with this last-expressed opinion. The mere fact of the use of a refrigerator in a private house would indicate a style of living more than simply comfortable. It would be the exception rather than the rule to find them where incomes were less than £1,000 ($4,866.50), and doubtless even at a higher range of expenditure their employment is not universal.

It can not be said that there are any peculiar features required in the construction of refrigerators for use here. The chest-shaped refrigerator is said to be the shape usually sold, and my informant states that an effort to introduce the cabinet or upright shape was not successful, as he thinks.

The bulk of the refrigerators used here come from London and Birmingham, according to my advices. No importations from the United States have come to my knowledge.

Sizes of refrigerators in use and likely to meet with sale are given by one firm as ranging from 18 inches high, 24 inches wide (front), 18 inches deep (front to back), for the smallest size, to 24 inches high, 36 inches wide (front), 24 inches deep (front to back), for the largest size. Range of prices, according to quality and finish: Small size, $14.60 to $19.47; large size, $29.20 to $48.67.

The 24 by 36 by 24 inches is quoted by this firm as the most convenient and best suited to ordinary use, selling at retail at from $29.20 to $34.07.

Another estimate of size makes them vary from 22 by 20 by 29 inches to 7 feet 6 inches by 10 feet by 2 feet 6 inches, with prices rising from $12.17 to $243.33.

They mention a size of about 27 by 21 by 30 inches as most convenient and best suited to ordinary use, and quote a price therefor of $21.90 to $24.33.

A third firm names the dimensions as here:

Smallest size, 30 inches high, 22 inches wide (front), 20 inches deep (front to back). Range of price for such a size, according to quality and finish, $17.88 to $23.60.

Largest size, 36 inches high, 50 inches wide (front), 27 inches deep (front to back). Range of price for such a size, according to quality and finish, $38.32 to $45.99.

Average size most convenient and best suited to ordinary use 33 inches high, 26 inches wide, 24 inches deep (back to front). Such a refrigerator would be sold at retail for $24.33.

The conditions of climate are not such in this district as to necessi-

tate the employment of artificial temperatures for the preservation of perishable articles. Many years go by without bringing weather, beyond a few days perhaps, when a refrigerator would be of use; and it may be said that it never is warm enough to require such appliances beyond a few weeks during the twelve months, and even that at broken intervals. Every house occupied by persons whose circumstances would warrant the outlay necessary to obtain a refrigerator is provided with cellarage, where meat, vegetables, and so forth are kept before being used. These cellars, while below the exterior level of the ground, are generally well ventilated, and, being furnished with stone tables, they serve the purpose of a cold-air chamber, with the great advantage of abundant space and conveniences of storage.

If United States manufacturers were prepared to place sample stocks at central points and advertise and solicit, it is quite probable an increase in the demand for refrigerators could be brought about, and possibly a remunerative trade established. The progress at first would in all likelihood be slow. The tendency here, however, is continuously in the direction of luxury, and the ability to buy, once granting the existence of the wish, is beyond any peradventure. Trade of all kinds is flourishing, and there could hardly be a more propitious time than the present for the introduction into general use of anything designed to add to the comfort of living.

Ice at retail is only to be had from fishmongers, who, in connection with their regular business, are in the habit of supplying ice to those who require it. There are no regular ice dealers making that their sole business in Leeds. This fact alone would seem to show how far from general is the use of ice in the community.

Two of the largest fishmongers in Leeds report sales of ice; one at the rate of 2 to 3 tons per week, the other at 4 tons per week in winter and 12 to 15 tons in summer. A ton a week is 320 pounds a day, which would give thirty-two families 10 pounds a day. There are probably seventy-two thousand families averaging five persons each in Leeds at the present time. The dealer last referred to sells about six refrigerators in a season, and says the principal demand for ice is for hotels and restaurants.

Retail prices of ice in Leeds are about as follows:

Less than 7 pounds at a time, 3 to 4 cents per pound.

Per 7 pounds, 18¼ to 24⅓ cents per 7 pounds.

Per 14 pounds, 18¼ to 36½ cents per stone.

Per 56 pounds, 48½ to 61 cents per half hundred-weight.

Per 112 pounds, 73 to 97⅓ cents per hundred-weight.

The last price, it will be observed, makes an average of about three-quarters of a cent a pound for 112-pound parcels.

F. H. WIGFALL,
Consul.

UNITED STATES CONSULATE,
Leeds, February 10, 1890.

LIVERPOOL.

REPORT BY CONSUL SHERMAN.

Refrigerators are used in this consular district, but only to a very limited extent, confined almost wholly to butchers.

There are no peculiar features required in the construction of refrigerators in this district.

The refrigerators in use in this district are manufactured in Liverpool.

Those used by butchers are of all sizes and a variety of forms. Those for the larger butchers are made on the principle of a steamer's ice-house, holding say 30 hundred-weight to 2 tons of ice, leaving room to hang joints from bars running through near the top. Few are used in families, and the style preferred seems to be that shown with prices in the annexed cut marked A.

It is a double box with two lids, the inner one being lined with zinc and fitted with shelves. The space between the two is filled with charcoal or sawdust.

The ice is placed in the bottom of the inner box.

Three-fourths of the ice used in Liverpool is brought from Norway, and the remaining one-fourth is manufactured here.

The retail prices are as follows:

	s.	*d.*
Under 12 pounds, per pound	0	1¼
12 pounds	1	0
28 pounds	1	6
35 pounds	2	0
42 pounds	2	6
56 pounds	3	0
1 cwt	5	0

Much lower rates are charged to people contracting for stated quantities regularly.

The wholesale price is 25 to 40 shillings ($6.08 to $9.73) per ton.

There is and can be but very little demand for refrigerators for family use in this climate, where all ordinary food of the household can be kept sufficiently well in all seasons without them.

One dealer advertises "The American Refrigerator" for family use, but evidently very little effort is made to push it.

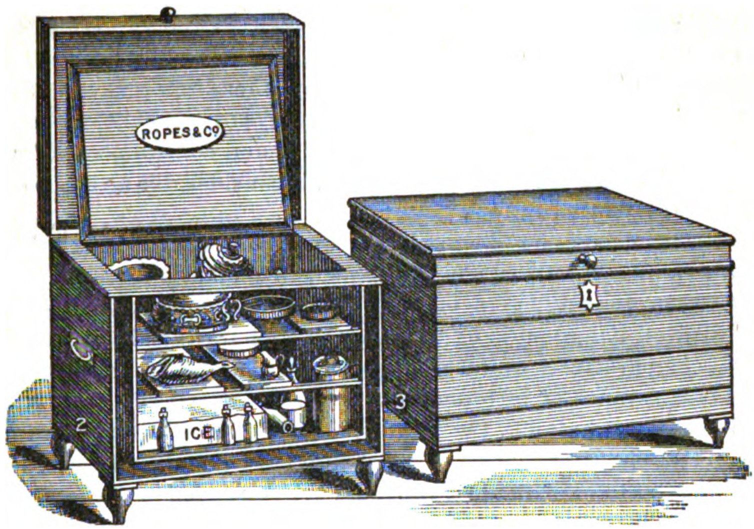
As to the best manner of introducing refrigerators into this district, I can only say that if some active and enterprising local agent were to take a well-made, serviceable, low-priced refrigerator for family use he might find many customers.

THOS. H. SHERMAN,
Consul.

UNITED STATES CONSULATE,
Liverpool, January 21, 1890.

Refrigerators, or portable ice-houses, to preserve the ice and furnish a provision safe under one lock.

[Inclosure in Consul Sherman's report.]



EXTERIOR DIMENSIONS.

	Length.	Width.	Height.	Price.		Length.	Width.	Height.	Price.
	Ft. In.	*Ft. In.*	*Ft. In.*	£ s.		*Ft. In.*	*Ft. In.*	*Ft. In.*	£ s.
No. 1	1 6	1 1	2 2	2 10	No. 4	3 6	2 4	2 11	6 0
No. 2	2 4	1 9	2 4	3 10	No. 5	4 0	2 8	3 2	8 0
No. 3	3 3	2 1	2 8	5 0					

LONDON.

REPORT BY CONSUL-GENERAL NEW.

I have personally visited or been in correspondence with all the extensive manufacturers and dealers in refrigerators of whom I have had or could obtain any knowledge, and will answer the interrogatories of the Department as best I can from the information thus obtained.

Refrigerators are used in this consular district quite extensively in the larger meat and vegetable warehouses and markets, but to a very limited extent for domestic or household purposes.

While no peculiar features in the construction of refrigerators exist in this district other than would be required for like purposes in the United States, yet as a matter of fact the refrigerators are here more generally permanent fixtures rather than movable furniture, as with us, when they are used for ordinary or household purposes.

They are mostly manufactured within this district, although there are a few houses dealing in American refrigerators.

They are of all sizes and prices; of those that are permanent fixtures,

they being constructed by special contract because of convenience, location, and adaptation, it is not possible to give cost, being cost of days' labor and material used; but of those that are movable and made in numbered sizes I furnish herewith price lists from the leading dealers.

For very large and extensive uses, such as the larger breweries and meat-preserving stores, ice is extensively manufactured here, but for other uses ice is imported from Norway, there being several lines of steamers engaged in the trade to various parts of the United Kingdom. But it should be borne in mind that the use and consumption of ice in the United Kingdom is very limited and inconsiderable as compared to its use in the United States.

The price of ice per 112 pounds at warehouses is 28 cents; delivered within a radius of 3 miles from warehouse, from 49 to 73 cents.

The reason that refrigerators and ice are not more extensively used in the United Kingdom is because of the climatic conditions and the general comparatively uniform and moderate temperature.

The best manner of introducing refrigerators in this consular district would be, in my opinion, the establishment of large central agencies and show-rooms in the cities of the United Kingdom, with some competent person to explain their uses and convenience.

I inclose herewith a quantity of literature, viz, descriptive catalogues, price lists, etc, which I have picked up in making the inquiries necessary to furnish the information required by the circular of the Department. The inclosed documents furnished in detail a great amount of information and data that will be valuable to American manufacturers of refrigerators who desire to enter their goods in competition with those manufactured in this country and is largely descriptive of the methods now in use.*

JNO. C. NEW,
Consul-General.

UNITED STATES CONSULATE,
London, February 3, 1890.

THE PONTIFEX ICE-MAKING AND REFRIGERATING MACHINES.

[Inclosure in Consul-General New's Report.]

These machines are now so well known and have been so extensively and successfully adopted that it would almost appear superfluous to enter into any detailed description of their merits and of their system of working. The subject of artificial refrigeration, however, is often not clearly understood. It is a comparatively new one, and has not yet received that attention which has been bestowed on other branches of mechanical science.

Pontifex & Wood, Limited, therefore take this opportunity to bring before their friends a description of their patent apparatus, and to make a comparison between it and other inventions intended to achieve similar results.

* Only one inclosure printed herewith; the whole being too voluminous for publication.

Ammonia and ether are the only two agents which produce cold sufficiently cheaply for ordinary commercial purposes, and which are not attended with other overwhelming difficulties. The comparison for all practical purposes may, therefore, be confined to them.

The boiling-point of ammonia is 120° lower than that of ether. Its latent heat is nearly six times as great. The tension of its vapor at an equal temperature is nearly thirteen times as great.

Apart from the advantages which ammonia affords in dispensing with the use of large and costly air-pumps, its above-named properties enable it, by the Pontifex process, to produce ice at one-fifth the cost for fuel of its production by ether.

Ammonia also posesses the advantage over ether that it is not inflammable, and the insurance companies therefore make no objection to its use. Neither does ammonia corrode the metal with which it comes in contact; on the contrary, it possesses the property of preserving the iron and steel of which the machine is made. It is also by far the least expensive in its first cost.

At the time the Pontifex ammonia machine was first placed commercially in the market, in 1875, the ether machines which were of earlier invention were already well established as being the only process then available; and in view of the comparatively large first cost and the little understood character of all descriptions of artificial refrigerating machines, it is easily to be understood that the prejudice against any new process was hard to overcome.

However, as time has gone on, the merits of ammonia machines have been realized, and ether machines have been gradually driven out of the market. At this present time scarcely any, if any, of them are being made. Nothing can more clearly show that the ether machines are practically extinct than the fact that the manufacturers of them finding their trade gone are endeavoring to place upon the market various forms of ammonia machines, modified in the hope of evading the patents held by Pontifex & Wood, Limited.

It is, therefore, unnecessary at this date to recapitulate the further advantages which the use of ammonia presents over that of ether, and the comparison rests between the various forms of ammonia machines. Before preceeding with it, however, some description of the Pontifex apparatus will be desirable.

DESCRIPTION OF THE PONTIFEX PATENT AMMONIA ABSORPTION REFRIGERATING MACHINE.

It is a well-known physical law that on the change of any liquid into the gaseous form, with a corresponding increase of bulk, a large amount of its contained heat is rendered latent; and on the reverse operation taking place the latent heat in the gas is rendered sensible, so that it can be readily removed. The Pontifex machine works on this principle. It consists of a number of very strong cast-iron cylindrical vessels connected together by pipes and cocks. The first of these is a large horizontal vessel called the generator, into which a charge of commercial liquor ammonia is placed. This vessel contains a coil of steam-pipes, heated by steam from the ordinary steam-boilers, so as to evaporate the ammonia, which rises up a vertical cylinder called the separator, placed on the top of the generator. This separator is so constructed that any watery vapor rising with the ammonia is condensed and returned to the generator. From the top of the separator a pipe conveys the gas to the condenser, consisting of a number of coils of pipes, contained in a wrought-iron vertical cylinder, which is kept full of water in circulation. In this condenser the evaporated ammonia gas is condensed into a liquid form by the pressure caused by its own accumulation. This liquid next passes to the cooler, which is a vertical cast-iron vessel containing coils of wrought-iron pipes. In the cooler the liquid ammonia, which leaves the condenser at a temperature of about 70° or 80° Fahr. is allowed to expand into gaseous form. In doing so its sensible heat is rendered latent, as above described, and its temper-

ature is ordinarily reduced down to about 10° to 20° Fahr., or say 22° to 12° of frost; but it can be reduced to a much lower point if desired. A circulation of water or brine is run through the coils of pipes in the cooler, and the expanding ammonia gas cools this water or brine down to any desired temperature. After doing this the ammonia gas passes away through a pipe into another vertical cylinder called the absorber, in which it meets with and is absorbed by the water from which it was first evaporated in the generator. From the absorber the liquid ammonia is drawn by pumps which force it back through an economizer or heater (thereby raising its temperature by means of the water which is running from the generator into the absorber) into the generator. From this generator it is evaporated again, and the operation is continuous, the same ammonia and water being used indefinitely.

The method of work is as follows: After all the connections are made, the machine is started by filling the generator with the ordinary ammoniacal liquor of commerce, and a little steam is admitted into the coil of pipes inside the generator, so as to raise just sufficient pressure of gas to expel all the air in the machine through a valve provided for the purpose on the absorber.

When all the air is thus expelled, the full pressure of steam is turned into the generator coil. The ammonia in the solution being very volatile is immediately driven off in the form of gas, and passes through the separator into the top of the condenser, the water of the solution being left behind in the generator.

The condensing water is admitted at the bottom of the condenser and run off at the top, the ammoniacal gas passing down through a coil of pipe contained in the condenser.

The upper part of this coil is called the rectifier, and is fitted at intervals with traps or pockets. The gas, passing down the coil, is cooled by the condensing water, and parts with any watery particles that may have been carried over with the ammonia. This water is caught in the traps and is at once passed out of the coil and returns into the separator.

The ammoniacal gas, after passing the lowest trap, is quite dry or anhydrous, and, as explained elsewhere, the attainment of this perfectly dry ammoniacal gas is the principal cause of the great superiority of the Pontifex machine over all others.

The dry ammoniacal gas continues to pass on down the coil in the condenser until by its accumulation it reaches a pressure at which the gas becomes liquefiable, the liquefaction being greatly assisted by the reduction of temperature due to the condensing water used.

We have now obtained liquid anhydrous ammonia, and the apparatus is so arranged that, as the gas becomes liquefied, it passes into the cooler.

The ammonia in this vessel, being quite free from water, vaporizes, under the ordinary pressure of the atmosphere, at a temperature as low as 60° below freezing point. At any higher temperature it passes freely into a gaseous form, and at the moment of thus changing its form it absorbs and renders latent an immense amount of heat.

The only source from whence it can abstract this heat is from the contents of a coil of pipe provided for that purpose in the cooler cylinder.

In breweries the water to be cooled is passed direct through this coil; and for ice-making a strong solution of chloride of calcium, or brine, as it is called, is passed through it, which, after being cooled to a very low temperature, is pumped to the ice boxes, there to freeze the water and convert it into ice, returning again to the machine to be recooled for further use.

The ammonia, now again in the gaseous form, passes from the top of the cooler into the absorber. A pipe connects this vessel with the bottom of the generator, through which the pressure in the latter forces a constant stream of the water left in it at starting into the absorber. This water, containing little or no ammonia, greedily absorbs the gas coming from the cooler, and the two form a strong solution of ammoniacal liquor similar to that originally put into the generator. This solution is

then drawn away by one of the pumps and forced through a coil of pipe in the economizer or heater G into the top of the separator. The solution, now rich in ammonia, then passes down the cylinder through a series of trays; these trays being heated by the hot vapor rising from the generator, the ammonia is again separated from the water in which it is dissolved, and the solution gradually becomes weaker until it falls into the generator almost entirely exhausted of ammonia.

The ammonia, now once more in the form of gas, passes into the condenser as before, to be again made dry and liquefied, thence to the cooler, where by its reconversion into vapor it again produces the cold, and passes once more back to the absorber and pumps.

Thus the whole process forms a continuous cycle, the same changes from liquid to gas and gas to liquid being constantly repeated, with no destruction of material whatever except of the little quantity of coal consumed under the boiler.

The economizer or heater utilizes the heat of the water as it passes from the generator on its way to the absorber, by heating up the ammoniacal solution before it enters the separator, and so saves steam; whilst at the same time the reduced temperature of the water enables it to re-absorb a larger proportion of ammoniacal gas.

We now proceed to a comparison between the Pontifex absorption and other forms of ammonia refrigerating machines.

First as to other forms of ammonia absorption machines:

English machines, number in use.—There are some two or three other forms of these besides the Pontifex offered for sale in this country. These have been patented within the last twelve months, but so far as is known not one of them has been made and worked. Thus, they have not yet even reached the experimental stage, and it is consequently impossible to make any practical comparison with them.

It will be observed, therefore, that in the United Kingdom the ammonia absorption machines have from the first maintained their pre-eminent position. On the Continent and in America they have only recently been introduced. The latter country is the great field for the use of artificial refrigeration, and the most recent advices from the United States remark that "there is no doubt that the absorption are going to supersede the compression machines."

Foreign machines.—In addition to the English machines above mentioned, there are one or two continental and American manufacturers who have attempted to make ammonia absorption machines. They have, however, lacked the perfect arrangement of analyzer or separator, which is the most important and distinguishing feature of the Pontifex machine, and, therefore, it has been found impossible to work them continuously. In addition to this, they have been so badly designed and constructed that their leakages of ammonia have been excessive, break-downs frequent, and costs of repairs very heavy, so that they have obtained a very bad reputation. None of these machines have been placed on the English markets.

Next as to ammonia compression machines. In these machines the ammonia gas, as it leaves the refrigerator or cooler of the apparatus, is drawn into a gas-pump worked by a steam-engine or other convenient motive power, and there compressed into a liquid by the direct application of the steam power. It is manifest that an enormous amount of steam-engine power is required to work this gas-pump and to compress such large volumes of gas into liquid by means of the heavy pressure which is required for the purpose.

STEAM-ENGINE POWER REQUIRED.

In the Pontifex machine, this is only about one-sixth part of that required by all ammonia compression machines. The following table shows this:

No. of machine	B.	C.	D.	D1.	E.	E1.	F.	G.
Size of machine in water cooled from 55° to 45° Fahr. per hour	450	1,200	2,200	2,750	3,250	4,350	5,500	8,000
Steam-engine power required by the Pontifex machine, about	1½	2	3	3½	4	4½	5	6
Steam-engine power required by ammonia compression machines, about, with condensing water at 50°	....	10	15	....	25	....	....	45
Steam-engine power required by ammonia compression machines, about, with condensing water at 85°	....	15	22	....	37	....	....	67

In all such cases the indicated horse-power required, which, of course, is much greater than the "nominal" or "effective," has been taken, including the power required for driving the brine and water circulating pumps.

STEAM-BOILER POWER REQUIRED.

In the Pontifex machine, besides the steam required to drive the small steam engine, some is required for heating the coil in the generator, but the quantity is still very much less than in the ammonia compression machine, as shown by the following comparison:

No. of machine	B.	C.	D.	D1.	E.	E1.	F.	G.
Size of machine in water cooled from 55° to 45° Fahr. per hour	450	1,200	2,200	2,750	3,250	4,250	5,500	8,000
Steam-boiler power required by the Pontifex machine, about	4	5	6	7	8	10	12	15
Steam-boiler power required by ammonia compression machines, about, with condensing water at 50°	....	10	15	....	25	....	....	45
Steam-boiler power required by ammonia compression machines, about, with condensing water at 85°	....	15	22	....	37	....	....	67

The amount of coal consumed is approximately proportionate to the amount of steam-boiler power required by the two systems.

These two points, *i. e.*, relative sizes of steam-engine and boiler required, are of the utmost possible importance. With a small engine and boiler, the coal bill is kept small, the amount of lubricant for the engine is reduced, and one man can look after one or even two machines and can also stoke the boiler. With a large engine and boiler, in addition to heavy coal and oil bills, a separate engineer is required to run the machine, and a stoker to look after the boiler. The charges arising from these necessities are constant—recurring daily—and will very soon amount to the value of the machine.

AMOUNT OF CONDENSING WATER REQUIRED.

In consequence of the great height of the Pontifex condenser, the water entering at the bottom is enabled as it rises and gets warmer to continue to do work in cooling the hotter gases as they descend from the top of the coils, consequently much less

condensing water is wanted by the Pontifex than by the ammonia compression machine, as shown by the following comparison:

No. of machine	B.	C.	D.	D1.	E.	E1.	F.	G.
Size of machine in water cooled per hour from 55° to 45° Fahr.	450	1,200	2,200	2,750	3,250	4,350	5,500	8,000
Condensing water at 50° Fahr. required by the Pontifex machine, about, galls. per hour	200	400	800	1,050	1,250	1,700	2,100	3,000
Ditto required by ammonia compression machine, about, galls. per hour	....	750	1,500	....	2,500	....	....	5,000

This question of condensing water is often of the utmost possible importance; as, for instance, in breweries, where frequently the water has to be brought by measure from water companies, or pumped from great depths. In such cases. the smaller consumption of the Pontifex machine is an enormous advantage, and by making special arrangements the quantity can, if required, be reduced still further. It must, however, be clearly unders'ood that the quantity of the water can only be reduced to its minimum when care is taken to keep the condenser coils clean, so that the surfaces may be fully effective; and that care is taken that water is not allowed to run to waste through the machine. If the initial temperature of the condensing water is higher than 50° Fahr. the quantity required is correspondingly increased.

The amounts of steam power and condensing water above given for the ammonia compression machines are taken from the latest issued catalogues of the makers of these machines. Although these quantities can be to some extent varied, it is impossible from the nature of the case that they can be materially altered, except by increasing them.

AMOUNT OF LUBRICANT REQUIRED.

In the Pontifex machine this is reduced to the infinitesimal amount of oil required to lubricate the eccentrics and pins of the ammonia pumps, their plungers or rods being lubricated by water. In addition to this, a little oil or tallow is wanted for the small engine which drives the pumps.

In the ammonia compression machine a very considerable amount of special lubricant is required for the large piston, piston rod, and cylinder of the gas pump, which has to pump a very hot dry gas against a heavy pressure. As ordinary oils are unsuitable for this purpose by reason of their liability to saponification by the ammonia, glycerine, or other special lubricant has to be used and in such quantities that a special pump is generally required to force it into the gas pump cylinder. The glycerine is largely carried over mechanically from the gas pump into the condenser, and to prevent its clogging the machine it has to be drawn off through traps, and to be rectified in a special apparatus to enable it to be re-used. Nothing of this sort has to be done with the Pontifex machine.

DURABILITY AND NON-LIABILITY TO BREAK DOWN.

Wear and tear in all machines only occur in those parts which move or which are liable to corrosion.

In the Pontifex machine the only moving part is a small single or double acting pump with one or two suctions and one or two delivery valves. This pump is of the simplest design, can be repaired by any ordinary mechanic, and gives no more trouble in looking after than a common little boiler feed-pump. It has to pump a comparatively cool liquid solution of ammonia and water, and therefore no trouble is experienced in keeping tight its one stuffing box-joint or gland. It requires no lubrication. To prevent the possibility of breakdown, this, the only moving part of the machine, is generally made in duplicate, with cocks so arranged that if one pump

gets out of order it can be shut off from the apparatus and the other started to work without one moment's stoppage, and repairs to the idle pump can be made while the machine is running. Thus the only moving part of the machine is duplicated so that those having one Pontifex machine are in practically as good a position as those having two of any other design.

In ammonia compression machines, on the other hand, the moving and most important parts consist of a very powerful steam-engine and large dry hot gas pump, with a large and ponderous fly-wheel often weighing several tons, pistons and rods, connecting rods, cranks, shafts, etc. The liability to and cost of repairs and breakdowns is therefore of course proportionately greater.

With regard to corrosion, ammonia either in its anhydrous state or combined with water has no injurious action on iron or steel surfaces with which alone it comes in contact in the Pontifex machine. On the contrary it has a directly preservative effect, coating the surfaces with a fine protective film or enamel, and doing nothing further. A competitor states that the hot solution of ammonia and water in the Pontifex machine has a corrosive effect on iron. This is absolutely incorrect and erroneous, as indisputably proved by the fact that after working the number of Pontifex machines for so many years no single case has ever been discovered of any corrosion whatever having taken place, and the whole of the Pontifex machines ever made are now at work and as fit for work as when first started. No machine has ever worn out, and, indeed, no limit can be placed upon the duration of these machines.

Safety.—The Pontifex machine consists chiefly of a number of wrought-iron lap-welded coils of pipes, capable of bearing a pressure of several thousand pounds per square inch, placed in very heavy and thick cast-iron vessels, which are designed to bear a strain of over ten times the usual working pressures, and very carefully cast from special brands of pig-iron. The whole apparatus is tested twice to more than three times the ordinary working pressures. It is, therefore, practically impossible for any accident to occur; in proof of which it may be stated that no accident whatever causing danger to or loss of life or limb, or damage to property, has ever occurred with any Pontifex machine.

Foundations.—The Pontifex machine having such very small moving parts requires simply a floor to stand it on which is capable of carrying the weight; the ammonia compression machine requires very large and extensive foundations to take the strain of the heavy moving parts.

In hot climates another advantage of the Pontifex machine comes in with special importance. Where the condensing water is hot the ammonia has to be evaporated and condensed under greater pressure and a higher temperature, and therefore a correspondingly higher steam pressure is required to work the machine. For example, a Pontifex machine working in this country with condensing water at 50° Fahr. would require steam at a pressure of 20 to 30 pounds per square inch; while in the tropics, with condensing water at 85° to 95° Fahr., the steam pressure required would be 40 to 50 pounds per square inch. This means a higher pressure of steam, but only about 10 to 20 per cent. more in quantity to do the work—meaning a coal bill increased by 10 to 20 per cent. But with an ammonia compression machine, as the same amount of gas has to be compressed into a liquid under all conditions of condensing water, and as an increase from 50° to 95° in the initial temperature of the condensing water causes the gas to require nearly double the pressure to condense it, it follows that in the tropics the amount of steam-engine power required to do the same useful work is nearly doubled, which means a coal bill increased nearly 100 per cent.

Chemicals.—A point of minor importance in favor of the Pontifex machine is this: The liquor ammonia used in it is an ordinary commercial article, which can be readily and commonly procured at a cost of 3*d.* to 4*d.* per pound. It is conveyed in ordinary light iron kegs, without trouble or danger. The anhydrous ammonia, used in the am-

monia compression machine, is a special article, only obtainable in this country at one or two places, costing about 3s. per pound, and it can only be conveyed in special steel or welded iron tubes under heavy pressure, and can only be transferred from the tubes to the machines by coupling them up together with special pipes, and at some trouble and risk of loss.

The amount of ammonia required to be added after the first charge in the Pontifex machine depends upon the care taken in packing the ammonia pumps. It should not exceed, and in many cases has been found to be less, in value than £3 to £5 per annum.

TABLE OF RESULTS OBTAINED BY THE PONTIFEX MACHINES.

COOLING WATER.

Size of machine.	Ice, equivalent in tons, melted per twenty-four hours.	Gallons of water reduced in temperature 10° Fahr., per hour.	Floor space required.	Power of steam-engine.*	Power of steam-boiler.†	Size of machine.	Ice, equivalent in tons, melted per twenty-four hours.	Gallons of water reduced in temperature 10° Fahr., per hour.	Floor space required.	Power of steam-engine.*	Power of steam-boiler.†
			Ft. Ft.	*H. P.*	*H. P.*				*Ft. Ft.*	*H. P.*	*H. P.*
A........	1½	225	10 by 5	1	2	E........	20	3,250	20 by 12	4	8
B........	3	450	12 6	1½	4	E1......	28	4,350	22 13	4½	10
C........	8	1,200	15 9	2	5	F........	35	5,500	22 13	5	12
D........	14	2,200	17 10	3	6	G........	50	8,000	23 14	6	15
D1......	17	2,750	20 12	3½	7						

* It is to be observed that in very many cases existing steam-engines can be made available for supplying the very small amount of engine-power required, the pumps being driven from existing shafting by pulleys and leather belts. In such cases o special steam-engine is not required.

† These figures denote the horse-power of boiler, which would be supplied with a machine, but much less power would be required if any can be spared from boilers already in use. In such cases all that is required is to run a small steam-pipe from the boilers to the generator of the machine.

The following reduces the above table of quantities of water cooled into the form in which it is most useful to brewers:

Barrels (thirty-six gallons each) of water cooled in twelve hours.

Size of machine..................	A.	B.	C.	D.	D1.	E.	E1.	F.	G.
Ice, equivalent in tons, melted per twenty-four hours	1½	3	8	14	17	20	28	35	50
Degrees Fahr.									
From 50 to 40	75	150	400	733	917	1083	1450	1833	2666
50 45	150	300	800	1466	1834	2166	2900	3666	5332
55 40	50	100	266	488	611	722	966	1222	1777
55 45	75	150	400	733	917	1083	1450	1833	2666
55 50	150	300	800	1466	1834	2166	2900	3666	5332
60 40	37	75	200	366	458	541	725	916	1333
60 45	50	100	266	488	611	722	966	1222	1777
60 50	75	150	400	733	917	1083	1450	1833	2666
60 55	150	300	800	1466	1834	2166	2900	3666	5332
65 40	30	60	160	293	366	433	580	733	1066
65 45	37	75	200	366	458	541	725	916	1333
65 50	50	100	266	488	611	722	966	1222	1777
65 55	75	150	400	733	917	1083	1450	1833	2666
70 40	25	50	133	244	305	361	483	611	888
70 45	30	60	160	293	366	433	580	733	1066
70 50	37	75	200	366	458	541	725	916	1333
70 55	50	100	266	488	611	722	966	1222	1777

COOLING AIR.

Size of machine.	Ice, equivalent in tons, melted per twenty-four hours.	Number of cubic feet of air reduced in temperature 10° Fahr., per hour.	Floor space required.	Power of steam-engine.*	Power of steam-boiler.†	Size of machine.	Ice, equivalent in tons, melted per twenty-four hours.	Number of cubic feet of air reduced in temperature 10° Fahr., per hour.	Floor space required.	Power of steam-engine.*	Power of steam-boiler.†
			Ft. *Ft.*	*H. P.*	*H. P.*				*Ft.* *Ft.*	*H. P.*	*H. P.*
A........	1½	60,000	10 by 5	1	2	E........	20	850,000	20 by 12	4	8
B........	3	120,000	12 6	1½	4	E1........	28	1,050,000	22 13	4½	10
C........	8	250,000	15 9	2	5	F........	35	1,250,000	22 13	5	12
D........	14	550,000	17 10	3	6	G........	50	1,900,000	23 14	6	15
D1........	17	700,000	20 12	3½	7						

* It is to be observed that in very many cases existing steam-engines can be made available for supplying the very small amount of engine-power required, the pumps being driven from existing shafting by pulleys and leather belts. In such cases a special steam-engine is not required.

† Care must be taken not to confound the number of cubic feet of air with the cubical contents of the chambers to be cooled. In consequence of the air circulation and the radiation through the roof and walls, etc., the cubical contents of the air in a chamber usually require to be cooled from eight to fifteen times every hour, in order that the temperature of the chamber may assimilate to that of the air passing out from the machine. Circumstances, however, vary so much that no useful rules can be laid down, and in every case a special inspection of the building is desirable.

Only one man is required to work any of the above machines, including stoking the boiler, and for the four smaller sized machines he would have spare time for other work. A man can attend two or more machines if required.

The cooling machines consist of an ammonia machine complete with all the usual connections and fittings, with ammonia pumps fitted on a cast-iron bed-plate and supplied with rods and eccentrics and shaft; or crank-shaft mounted in cast-iron A frames, and provided with pulley ready to be driven by a belt from an existing shaft or engine.

PONTIFEX MACHINES FOR COOLING WATER FOR USE IN REFRIGERATING AND ATTEMPERATING IN BREWERIES.

The most important purpose for which the Pontifex machine can be used in breweries, and that to which it has been most largely applied, is the cooling of the water to be used for refrigerating and attemperating. Where an unlimited supply of well water at 50° to 54° Fahr. temperature can be obtained, a cooling machine becomes of minor importance; but where, as particularly in many large towns, the well water supplies run short or give out, and the brewer has to rely on the town supply as provided by the water company, or on river water, a cooling machine becomes indispensable for the summer production of sound beers, and in many cases for the production of any commercial beers at all.

During the five summer months the town's water usually rises to from 65° to 68° Fahr. or even higher, and it is of course impossible with this to cool the worts down to the usual pitching temperatures of 57° to 59° Fahr. It is also impossible to control the fermentations in the tuns or squares with water of such high temperatures in the attemperators, and, on completion of fermentations, equally impossible to cool the finished beers down to the temperature desirable for racking. Under these circumstances the cooling machine gets the brewer out of all his troubles due to the high temperature of his water supply. The water, at a temperature of 65° or more, as it comes from the company's main or from the brewery water-pump, is run direct through the coil in the cooler of the Pontifex machine, and leaving it reduced to 50°, 45°, or any desired lower temperature, is forced still under its original water company's pressure, and without pumping, to the upper part of the brewery, where, at a height commanding the refrigerators and attemperators, it is discharged into a tank (by preference made of wood, or of iron lagged with wood and sawdust) from which the water is drawn off as required for refrigerating and attemperating.

H is the water-service from the company's main or from well or river water pumps to the cooler of machine. A cock on this pipe is adjusted to pass more or less of the water so that the latter may leave at the desired temperature as shown by a thermometer on the pipe J at the outlet from cooler.

I is the cooled water pipe leading away from the cooler of machine up to—

J, the ice-water tank in which the cooled water is stored to be drawn off as required for refrigerating or attemperating.

The arrangement is simplicity itself. The machine is fixed by preference on the ground-floor near the brewery steam-boilers and placed under the charge of the stoker or engine driver, no special man being required to work it. No special steam-boiler is required, so little steam being wanted that it generally only means the stoker putting on the boiler fire an extra two or three shovelfuls of coals per hour.

In ordinary daily working the machine is started in the morning in time to fill up the ice-water tank by the time the beer refrigerators are started. The machine continues running till the refrigerating is done, and is kept on till the tank is filled up again, leaving a supply of ice-water for the use of the attemperators during the night and until the machine starts again next day. Doubts have been expressed by many brewers as to whether the ice-water would remain cold when left standing in tank during the night and longer. Pontifex and Wood, limited, have therefore made very careful inquiries on this point, and they find that in covered wood tanks, or ordinary iron tanks covered and lagged with wood and sawdust, the rise of temperature has been quite insignificant—not more than 1° Fahr. during from twelve to twenty-four hours.

The practical results in a brewery are, in addition to the improvement in the beer and the complete control obtained over the refrigeration and fermentations, that the beer refrigeration can be done in very much less time and the day's work completed much earlier; and a complete stoppage of the enormous waste of water caused by the necessity to rattle the greatest quantity of the comparatively hot company's water through the refrigerators and attemporators to keep any sort of control of the operations.

It has been found, in most cases, that a saving of more than half the water company's bill for refrigerating and attemperating water has been made.

In large breweries, where great quantities of ice water are required, the machines are generally run continuously day and night. Pontifex machines have been fitted up in the above manner and for the above purpose at sixteen large breweries, the names of and introductions to which will be given upon application.

PONTIFEX MACHINES FOR COOLING THE AIR IN THE FERMENTING AND YEAST ROOMS.

Another very important purpose to which the Pontifex machine has been extensively applied is cooling the air in the fermenting and yeast rooms. Even in those breweries where an unlimited supply of cold water is obtainable it should always be remembered that the water can only be applied—in the fermenting vessels—to cooling the beer itself, and not to the head of yeast above the beer. Therefore, in hot weather, it is not of unfrequent occurrence for the fermenting beers to be well under control by the use of the attemperators, while the yeast above is going wrong, because of the great temperature of the air in the room. Under these circumstances, the Pontifex machine is extremely valuable. It enables the brewer to obtain an October temperature (50° Fahr. or less) at will in the hottest fermenting room and the hottest summer weather.

A circulation of brine (a solution of chloride of calcium in water) is pumped by the brine pump through the coils of pipes in the cooler, and the ammonia gas cools this brine down to somewhere near its own temperature—say about 10° to 20° Fahr. or 22° to 12° of frost, or very much lower, if desired.

From this cooler cold brine flow and return mains are run through the brewery, and up to the top of the building.

In the fermenting rooms rows of cast-iron flanged pipes are fixed over the tuns and squares to be cooled, and through these pipes branch circulations of the cold brine are carried from the brine flow and return mains. This cold brine cools down the pipes to below freezing point, and the surfaces of the pipes cool the air in the rooms down to 45° or 50° Fahr., or any desired temperature. By means of cocks provided on the various branch mains the speed of flow of brine through the various circulations, and consequently the temperature of the rooms can be regulated and reduced or increased at pleasure.

The air in the yeast rooms is cooled in the same manner.

In the simplest arrangement of the brine mains, the whole of the area of the fermenting room is cooled. A separate brine circulation is run over each row of rounds or squares, and all are cooled at once.

In a more elaborate arrangement, where a number of very large squares have to be cooled, the sides and tops of the squares are boxed in with light boarding, and under this boarding the brine pipes are fixed, a separate circulation to each square. This plan enables the temperature of the air over each square to be regulated separately, and the brine to be shut off separately from empty squares; it also economizes the work the machine has to do, as only the air directly over each vessel has to be cooled; but it is most suitable for adoption where the fermenting vessels are very large.

In this case, also, the machine is by preference fixed on the ground floor near the brewery steam-boilers, so that it can be attended to by the existing stoker.

In ordinary working, the machine is run during the day time, and when it is shut off at night and the fermenting rooms are closed up, the large amount of cold stored up in the brine in the pipes over the fermenting vessels is generally found sufficient to keep the rooms down to the desired temperature during the night. In very hot weather, and in very large breweries, however, the machine is generally run at night as well as day.

PONTIFEX MACHINES USED FOR THE COMBINED PURPOSES OF COOLING WATER FOR USE IN REFRIGERATING AND ATTEMPERATING AND COOLING THE AIR IN THE FERMENTING AND YEAST ROOMS.

This is accomplished by one machine in the following manner:

The machine is fitted up with brine pipes in the same way as last described. The fermenting and yeast rooms are cooled by brine pipes in the same way as last described. To cool the water the following plan is adopted, as shown by the illustration on opposite page.

At the top of the brewery building at a height commanding the refrigerators and attemperators, the ice-water tank is fixed. Over this tank is fixed a brass pipe brine refrigerator, consisting of horizontal rows of brass pipes through which a branch circulation of the cold brine from the brine mains is run, while over them the water from the company's mains, at 60° to 65° Fahr. or any other temperature is allowed to trickle, and in so doing it is cooled by the brine inside the pipes, and after cooling runs into the cold-water tank from which it is drawn through the pipes and as required for refrigerating and attemperating. By this arrangement the water can be cooled down to 33° Fahr. or any desired temperature above that.

On this plan by simply opening, shutting or regulating cocks, the whole or any desired proportion of the power of the Pontifex machine can be applied to cooling air or to cooling water, or both at the same time, according to the requirements of the brewery; and with the apparatus so arranged brewing can be conducted in the hottest weather with the same facility, certainty, safety, and convenience as in the autumn or winter.

COOLING THE AIR IN LAGER BEER FERMENTING ROOMS AND STORE CELLARS.

The illustration on the opposite page shows the method of cooling lager beer fermenting rooms and store cellars. The plan here adopted is similar to that for cooling

the air in fermenting and yeast rooms, with the differences that the temperature required being lower (about freezing point), larger quantities of brine pipes, and in some cases wrought-iron brine pipes of smaller diameter are provided.

APPLICATION OF THE MACHINES TO THE MANUFACTURE OF ICE IN ADDITION TO THEIR ORDINARY WORK.

It is frequently desired in breweries to make a small quantity of ice, either for use in keeping yeast cool, or to send out to public houses, or for private use.

When machines have a brine circulation this is very easily accomplished. If opaque ice will do, it is only necessary to place in the brine-tank galvanized iron pails or molds made of the shape of which the blocks of ice are required. These molds being filled with water and suspended in the brine-tank are, in a few hours, frozen by the brine outside into solid blocks of ice. The molds are then lifted out and turned upside down, when the ice-blocks drop out, the molds being made taper to allow of this.

When clear ice is required it is necessary to keep the water in motion while freezing, and then a more complete arrangement is required, called a patent pyramid ice-box. The illustration on the page opposite 16 shows this.

This shows a small special brine-tank made of wrought iron and lagged with wood and filled in with sawdust. A small branch brine-pipe with regulating cock—taken off the brine main from cooler—runs into one end of this brine-tank, and the warmed brine overflows from the other end of it running into the ordinary brine-tank. In this special brine-tank a number of ice-molds made of galvanized wrought iron and of pyramidal form are placed. Each of these molds is provided with a spiral agitator or endless screw, which being kept constantly revolving, keeps the water in process of freezing in motion. The agitators are kept revolving by means of a counter-shaft and pulleys driven by a gut band from the nearest convenient shafting. When freezing is finished the agitator is taken off and the mold lifted out and turned upside down, when a beautiful, clear, crystal pyramid of ice, as shown on illustration, appears. As the center of the mold freezes up last, freezing can be stopped at any point, and the hollow left in the block filled in with flowers, fruit, lobsters, etc., which can then be frozen up in the block.

When machines have no brine circulation, but are used for cooling water direct, the same pyramid ice-box is used. In this case, however, as there is no brine circulation, a coil of iron pipes is placed in the ice-box brine-tank, through which ammonia from the cooler is allowed to circulate, expanding in doing so into a gas, and so producing the necessary cold.

When larger quantities of ice are required, it is desirable that the refrigerating machine should be specially arranged accordingly and provided with either "cell," "wall," or "can" ice-boxes.

COST OF WORKING.

The cost of working a given size of refrigerating machine, whether used for cool ing water or air or both, is approximately the same. It is about as follows per day of twelve hours.

	A	B	C	D	Dr	E	E1	F	G
Quantity of coal used, about cwt.	2	3	4	5	5½	6	8	10	12
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
At 10s. per ton	1 0	1 6	2 0	2 6	2 9	3 0	4 0	5 0	6 0
Ammonia to replace loss, say	0 3	0 3	0 3	0 6	0 6	0 6	0 9	0 9	0 9
Oil, say	0 3	0 3	0 3	0 6	0 6	0 6	0 6	0 6	0 9
Total	1 6	2 0	2 6	3 6	3 9	4 0	5 3	6 3	7 6
If coals cost 15s. per ton add to above totals	0 6	0 9	1 0	1 3	1 5	1 6	2 0	2 6	3 0
If coals cost 20s. per ton add to above totals	1 0	1 6	2 0	2 6	2 9	3 0	4 0	5 0	6 0

The above are practical working figures where ordinary care is taken. No doubt with good coal and skillful firing and care in working the coal consumption can be reduced, but these conditions seldom exist. When a machine runs continuously for a long time at much less than full power—as in cooling rooms—the coal consumption is proportionately reduced.

The existing engine driver or stoker is assumed to be taking charge of the machine. Of course if a special man is provided his wages, say 3*s* 6*d*. to 4*s*. per day, be added.

Nothing is put down for condensing water, as the coal consumption is sufficient to include the steam power required to pump it from surface or a moderate depth, and it is assumed that the water itself is provided.

Depreciation and interest on capital—each usually taken at 5 per cent.—every purchaser will calculate on his usual system.

PONTIFEX MACHINES FOR ICE-MAKING.

Table of results obtained by the Pontifex machines.

Size of machine.	Ice made in 24 hours.	Ice equivalent in tons melted per 24 hours.	Coal consumed per hour.	Space required.	Power of steam-engine.	Power of boiler.	Size of machine.	Ice made in 24 hours.	Ice equivalent in tons melted per 24 hours.	Coal consumed per hour.	Space required.	Power of steam-engine.	Power of boiler.
	Tons.	*Tons.*	*Pounds.*	*Feet.*	*H. P.*	*H. P.*		*Tons.*	*Tons.*	*Pounds.*	*Feet.*	*H. P.*	*H. P.*
B.....	1½	3	27	25×20	2	5	E ...	9	20	80	55×35	5	10
C.....	4	8	48	35×25	3	6	E1 ..	12	28	100	70×40	5½	12
D....	6	14	65	46×30	4	8	F....	15	35	120	70×40	6	15
D1 ...	7½	17	72	55×35	4½	9	G ...	24	50	165	90×50	7	20

Ice-making machines are invariably required to run night and day, and the staff of men required to work them is usually about as follows:

Size of machine.	Engine driver or stoker, day.	Engine driver or stoker, night.	*Laborers to remove ice, day.	Total number of men required.	Size of machine.	Engine driver or stoker, day.	Engine driver or stoker, night.	*Laborers to remove ice, day.	Total number of men required.
A, B or C	1	1	1	3	E1 and F	1	1	3	5
D, D1, and E....	1	1	2	4	G	1	1	4	6

The ice-making machines consist of an ammonia machine complete, with steam engine and boiler, patent ice-boxes, with agitators and fittings capable of making perfectly clear, transparent ice; ammonia, brine relieving, boiler feed and condensing water pumps with driving gear; hot and cold brine tanks, shafting, riggers, and belts, and all brine and steam pipes between the various parts of the apparatus.

The Pontifex machine when applied to ice-making is similar to that used in breweries.

In addition, however, to the machine itself, ice-boxes are required in which to freeze the water into ice. These are made on different plans, as follows:

ICE-MACHINES WITH CAN BOXES.

The can box consists of a wrought or cast iron tank of large size, lagged with wood filled in with sawdust. This tank is filled with brine. A circulation of brine (a so-

*The number of laborers varies according to the class of men available and the facilities for removing, storing, and loading the ice. In hot climates, where black labor has to be employed, many more men are required.

lution of chloride of calcium in water) is pumped by the brine-pump through the coils of pipes in the cooler, and the ammonia gas cools this brine down to somewhere near its own temperature, which varies according to the thickness of the ice being made from 15° Fah. (above zero) to minus 10° (below zero) Fah. or lower. From this cooler a cold brine-pipe is run into one end of the brine-tank. From the other end of the brine-tank a warm brine-pipe is run back to the brine-pump, which continually draws brine away from the brine-tank as fast as it delivers it into the cooler, and so keeps up a constant circulation.

In the brine-tank galvanized iron ice-molds are placed. These are filled with water, and provided with agitators. These agitators are wood blades mounted in frames above the ice-molds, and being continually reciprocated by means of the steam-engine they keep the water in the molds in motion, which causes it to freeze up into clear ice. When freezing is completed the agitators are removed, and the ice-molds, being lifted out by means of the traveler, are carried horizontally to the relieving-tank (which is filled with part of the warm water running waste from the absorber) and dipped therein for a few seconds. The molds are then drawn out and reversed, when the block of ice drops out; and the mold is then filled with water and returned into the brine-tank and commences refreezing.

On this system of making ice the cans are each made of such a size as to produce a rectangular block of ice of given weight. For example:

Blocks weighing 1 cwt. each are made in cans 2 feet × 2 feet × 6 inches thick. Blocks weighing 1¼ cwt. each are made in cans 2 feet 6 inches × 2 feet 6 inches × 6 inches thick. Blocks weighing 2 cwt. each are made in cans 2 feet 6 inches × 2 feet 6 inches × 8 inches thick. Blocks weighing 3 cwt. each are made in cans 3 feet × 3 feet × 8 inches thick. Blocks weighing 4 cwt. each are made in cans 3 feet 6 inches × 3 feet 6 inches × 8 inches thick. Blocks weighing 6 cwt. each are made in cans 3 feet 6 inches × 3 feet 6 inches × 12 inches thick, or larger or of altered proportions as desired.

This is the oldest and simplest plan of making ice, and has many advantages:

(1) The first cost of an ice plant is considerably lessened.

(2) Where opaque ice is all that is required, it is not necessary to keep the water in motion, and agitators can be dispensed with.

(3) The blocks are produced of a uniform given size and weight, convenient to load and pack, and no weighing is necessary.

(4) If a can leaks it can be immediately placed on one side for repair, and a spare one takes its place without delay or any partial stoppage of the apparatus.

(5) The whole of the parts of the ice-box are very simple, and can be repaired or remade by any ordinary engineer without special knowledge of ice machinery.

On the other hand there are certain objections:

(1) The agitator blade occupies the middle of the can while the block is freezing, and as the ice freezes up it closes round this; to prevent it freezing in, the agitator has to be withdrawn and the space occupied by it in its traverse frozen up without agitation. Consequently each block has a narrow core of semi-transparent or almost opaque ice in the center. This, however, is only of slight disadvantage in appearance, and even this disadvantage disappears when the ice is broken up. Nor does it affect the keeping qualities of the ice.

(2) If there are any impurities in the water they are frozen up in the ice and tend to show to some extent in the center of the block.

(3) The blocks sometimes freeze up at different speeds, and it therefore may happen that, through carelessness in watching, some agitators get frozen in prematurely, causing their breakage.

(4) The cans, from having constant handling, sometimes leak and so cause a charge for repairs.

(5) Every time a block of ice is lifted out of the brine tank the can has to be lifted and handled with it, and there is a greater weight to handle over what there would

be if the ice only had to be dealt with. This and the extra handling of the empty cans may cause this plan to require a slight amount of extra labor.

(6) By carelessness water may be spilled or leaked into the brine, weakening it.

To reduce or obviate objections Nos. 1 and 2 a plan has been devised of placing a wood frame in the middle of the mould and letting the agitator work inside it—a block being frozen up at each end. This acts so far satisfactorily, but causes new difficulties. The wood freezes to the ice and has to be drawn out of the mold with it and removed by chisels and replaced in the mold; and a certain amount of dirty water has to be pumped out of each mold before removal of the ice, thus causing more hand-labor. In consequence, also, of the blocks freezing up at unusual speeds, some often come out of uneven shape, with a large hole in the center and of much less than the full weight.

To reduce objection No. 5, which is a very important one, various ingenious and complicated arrangements for handling a number of molds together with the assistance of steam-power have been devised. These have been more or less successful, but are evidently only imperfect attempts to overcome difficulties which do not exist in other plans of making ice.

ICE-MACHINE WITH BOXES ON THE WALL SYSTEM.

On this plan an ice-plant has two or more boxes. Thus a 2 or 4 ton plant has two boxes; a 6-ton, two or three boxes; a 9-ton, three boxes; a 15-ton, four or five boxes; and a 24-ton, eight to ten boxes.

The Wall box consists of a wood or wrought-iron water-tank. If made of iron, it is lagged with wood filled in with sawdust. In this tank a number of vertical galvanized cast-iron hollow walls or partitions are fixed by means of bolts to hollow cast-iron ends. Through these walls a circulation of brine cooled by the refrigerating ma·hine is pumped by the brine-pump through the cold-brine pipe. The tank is filled with water, which, being cooled by the brine, freezes on to the hollow walls. The brine, warmed by passing through the walls and freezing the water, goes away to the cold brine tank, from which the brine-pump draws it and forces it through the cooler of the machine, where, being cooled, it again passes to the Wall box and so completes its circuit, the circulation being continuous until the ice has finished freezing. To keep the water in motion agitators reciprocate between the walls as shown, these being driven by means of shafting by the steam-engine, which also drives the ammonia, brine, and water pumps. The hollow walls reach nearly to the bottom of the tank, being kept a few inches above it, and in the space left all impurities voided by the water in freezing settle.

The brine-pipes to the wall boxes are provided with cocks so arranged that when freezing is finished (which is accomplished when the ice has grown to within about ½-inch clear of the agitator) the brine can be shut off from the box (and turned on to others). The cold brine is then drained out of the walls into the cold-brine tank. There is a small warm-brine tank in which a reserve of brine, heated by means of a coil of steam-pipes by the exhaust steam of the engine or other means, is kept ready. This brine is forced by means of the small warm-brine pipes through the hollow walls of the wall-box, so melting the ice off, and leaving it ready for removal. The agitators are then lifted out. The ice-blocks so made are usually 14 feet long, 3 feet deep, and 6 to 10 inches thick. By means of a saw they are in the box cut into conveniently-sized blocks, say 3 feet 6 inches, by 3 feet, by 6 inches to 10 inches thick, and floating in the surplus water, are lifted out by the overhead traveler straight from the wall-box, and dropped into the cart standing ready to receive them,or dragged away to the store. The surplus water in the box is then filled up to the original level, the agitators are replaced, the warm-brine is shut off and drained out, the cold-brine turned on, and freezing commences. About once a week the water is all run out and the dirt at bottom of the wall-box washed out. Ice made on this plan is far superior to the best natural ice, being of much greater purity, and of the most attractive bril-

liant crystal clear appearance; and it can not be equalled by any other system of manufacture. Where purity and appearance are of great importance, as for restaurants, clubs, hospital, etc., this ice is always preferred to any other and fetches a higher price. The only objection to it is that it can not be obtained in blocks of uniform size and weight, without cutting up to shape, entailing waste and labor.

The advantages of this plan are:—

(1) Superior purity and appearance of the ice made.

(2) Scarcely any liability to breakage of agitators.

(3) No cans to handle or repair. The walls being fixed and of strong galvanized cast-iron are practically indestructible.

(4) Only the actual ice itself has to be handled, so much less weight has to be moved in comparison with the can system.

(5) When an ice box is finished it can be shut off by simply turning the cocks, and left till it is convenient to remove the ice. Thus all the boxes can be set so as to be completed during the day, and no night-shift of laborers is required.

(6) The water can not spill or leak into the brine and so weaken it.

The objections to this plan are:—

(1) The ice can not be produced in blocks of a given size and weight without waste and labor.

(2) If a box requires repairs it has to be shut off and the capacity of the machine is temporarily reduced in proportion. Repairs, however, are scarcely ever required; the shutting off is accomplished by simply turning cocks; and in a large machine the temporary proportionate reduction of capacity through a box being shut off for repairs is only from 10 to 20 per cent.

To remedy the objection No. 1, and to enable thicker ice to be made in a given time, Pontifex & Wood, limited, have designed their patent cell-box, which is next described.

ICE-MACHINE WITH PATENT CELL ICE-BOXES.

On this plan an ice plant has (as on the wall system) two or more boxes. Thus a 2 or 4-ton plant has 2 boxes, a 6-ton two or three boxes, a 9-ton three boxes, a 15-ton three or four boxes, and a 24-ton six to eight boxes.

The illustration opposite shows an ice plant to make 15 tons of ice per twenty-four hours, and provided with four-cell ice boxes. Opposite page twenty-two will also be found an illustration in detail to a larger scale of the patent cell ice-box. The cell ice-box consists of a wood or wrought-iron water tank. If made of iron it is lagged with wood filled in with sawdust. This tank is provided with (1) a galvanized wrought-iron hollow or double bottom; (2) two galvanized cast-iron hollow cross walls, or partitions; and (3) a number of short galvanized cast-iron longitudinal hollow walls fixed at right angles to the cross walls. Between the end of the tank and the ends of the longitudinal walls, open spaces are left. Each of these longitudinal walls is 3 feet 6 inches by 3 feet 6 inches, and they are fixed at a distance apart equal to the thickness of the blocks of ice it is desired to make, usually 9, 10, or 12 inches. Between each two of these longitudinal walls the ice forms, and therefore the blocks made are either: Three feet 6 inches by 3 feet 6 inches by 9 inches thick, weighing about 4½ hundred weight each, or 3 feet 6 inches by 3 feet 6 inches by 10 inches thick, weighing about 5 hundred weight each, or 3 feet 6 inches by 3 feet 6 inches by 12 inches thick, weighing about 6 hundred weight each.

Blocks have also been made 3 feet 6 inches by 3 feet 6 inches by 15 inches thick, weighing 7½ hundredweight each, and even of 3 feet 6 inches by 3 feet 6 inches by 1 foot 9 inches thick, weighing 10½ hundredweight each; but these extremely thick blocks are not recommended commercially as they take such a long time to freeze up. Through the double bottom, cross-walls, and longitudinal walls, a circulation of brine cooled by the refrigerating machine is pumped by the brine pump H through the cold brine pipe I. The tank is filled with water, which being cooled by the brine freezes

on to the double-bottom, cross and longitudinal walls. The brine, warmed by passing through the bottom and walls and freezing the water, goes away to the cold brine tank from which the brine pump H draws it and forces it through the cooler D of the machine, where being cooled it again passes to the cell box and so completes its circuit, the circulation being continuous until the ice is finished freezing. The two layers of ice gradually growing thicker between each two longitudinal walls at last meet and freeze together, when the block is finished. To keep the water in motion agitators reciprocate in the open spaces as shown, these being driven by means of shafting by the steam-engine, which also drives the ammonia, brine, and water pumps. The agitators in moving give an impulse to the water, causing it to rush in a wave between the longitudinal walls, and washing out all the impurities voided by the water in freezing, which settle at the bottom of the open spaces.

The brine-pipes to the cell boxes are provided with cocks so arranged that when freezing is finished the brine can be shut off from the box and turned on to others. The cold brine is then drained out of the double bottom and walls into the cold brine tank. There is a small warm brine tank in which a reserve of brine, heated by means of a steam coil of pipes by the exhaust steam of the engine or other means, is kept ready. This brine is forced by means of the small warm brine pump through the hollow double bottom and walls of the cell-box, so melting the ice-blocks off and leaving them ready for removal. The agitators are than lifted out. The ice-blocks are gently started away from the cross-walls to enable the ice-grips to grasp each end, and are lifted straight out by the overhead traveler P and dropped into the cart standing ready to receive them, or dragged way to the store. The surplus water in the box is then filled up to the original level, the agitators are replaced, the warm brine is shut off and drained out, and cold brine turned on, and freezing recommences. About once a week the water is all run out and the dirt at bottom of the cell-box washed out.

The ice turned out on this plan of cell-boxes is far superior to the best natural ice, being of far greater purity, clearness, and brilliancy, and produced in blocks of the most convenient form for commercial purposes.

The advantages of this plan are—

(1) The blocks are produced of a uniform size and weight, convenient to load and pack; and no weighing is necessary.

(2) The ice is of superior purity and appearance, and of great thickness.

(3) No liability to breakage of agitators.

(4) No cans to handle or repair. The walls are fixed and the general arrangement is of very great strength and practically indestructible.

(5) Only the actual ice itself has to be handled, so less weight has to be in comparison to the can system.

(6) No cutting up waste or weighing of ice, as in the Wall system.

(7) When an ice-box is finished it can be shut off by simply turning the cocks, and left till it is convenient to remove the ice. Thus all the boxes can be set so as to be completed during the day, and no night shift of laborers is required.

(8) The water can not spill or leak into the brine and so weaken it.

The only objection, if it can be called an objection, to the cell-box system, is that if a box requires repair it has to be shut off, and the capacity of the machine is temporarily reduced in proportion. Repairs, however, are scarcely ever required; the shutting off is accomplished by simply turning cocks; and in a large machine the temporary proportionate reduction of capacity through a box being shut off for repairs is only from 10 to 20 per cent.

COST OF WORKING AND PRODUCING THE ICE.

The cost of working varies considerably in different sized plants, working under different conditions; but Pontifex & Wood, limited, are prepared to guarantee, when required, that 15 and 24 ton plants shall be capable of producing in this country the

best clear ice at a cost not exceeding 5*s*. per ton; the cost being for labor, coals, oil, chemicals, and water for making the ice.

The following are approximate estimates of the cost of working:

G or 24-ton ice-plant.

	£	s.
Per week of six days:		
Coal, 12 tons, at 10*s*. per ton	6	0
Ammonia, to replace any leakage, say	0	6
Oil, say	0	4
Water to make ice of, adding 50 per cent. for waste, 50,000 gallons, at 6*d*. per 1,000	1	5
Wages, day engineer	1	15
Wages, day, four laborers to remove ice, at 20*s*	4	0
Wages, night stoker	1	5
	14	15
6 by 24 = 144 tons of ice made = 2*s*. ¾*d*. per ton of ice; if coal costs 20*s*. per ton add	6	0
= 2*s*. 10½*d*. per ton of ice	20	15

F or 15-ton ice-plant.

	£	s.
Per week of six days:		
Coal, 9 tons, at 10*s*. per ton	4	10
Ammonia, to replace any leakage, say	0	6
Oil, say	0	4
Water to make ice of, adding 50 per cent. for waste, 36,000 gallons at 6*d*. per 1,000	0	18
Wages, day engineer	1	15
Wages, day, three laborers to remove ice, at 20*s*	3	0
Wages, night stoker	1	5
	11	18
6×15=90 tons of ice made=2*s*. 7¾*d*. per ton of ice. If coals cost 20*s*. per ton, add	4	10
=3*s*. 7¾*d*. per ton of ice	16	8

C or 4-ton ice-plant.

	£	s.
Per week of six days:		
Coal, 3 tons, at 10*s*. per ton	1	10
Ammonia, to replace any leakage, say	0	3
Oil, say	0	2
Water to make ice of, adding 50 per cent. for waste, 10,000 gallons at 6*d*. per 1,000	0	5
Wages, day engineer	1	15
Wages, day laborer to remove ice	1	0
Wages, night stoker	1	5
	6	0
6×4=24 tons of ice made=5*s*. per ton of ice. If coals cost 10*s*. per ton, add	1	10
=6*s*. 3*d*. per ton of ice	7	10

With the above figures, and a knowledge of the local cost of coals and labor, each intending purchaser will be able to calculate for himself the approximate cost of producing ice in his neighborhood. To the above figures depreciation and interest on capital, usually each calculated at 5 per cent. per annum, have to be added. It will be observed that the cost of producing small quantities of ice is, as might be expected, relatively very much higher than of producing large quantities.

In hot climates, as India, etc., the machines usually fall off in their production of ice from 10 to 30 per cent., while the cost of working remains the same or becomes higher, but no fixed rules can be laid down for this.

PROVISION COOLING STORES.

Pontifex & Wood desire to draw attention to the gain to be made by securing an additional source of income to an ice plant by providing in conjunction therewith cold stores for the use of butchers, poulterers, fish mongers and others. These stores can be very simply cooled by a small proportion of the power of the ice-machine, and worked by the same staff.

PONTIFEX REFRIGERATING MACHINES FOR ARTIFICIAL BUTTER MANUFACTORIES.

In this manufacture the various ingredients, after being melted and mixed together at about blood heat in churns, are mixed with and run out into ice-cold water contained in open troughs; the sudden application of the intense cold crystallizing and granulating the artificial butter, which is skimmed off; and the water at the same time washing out the butter milk, which would taint the butter by its rapid decomposition. Originally and still to a large extent ice is used for the production of the ice-cold water, ice being placed in tanks filled with water, and melting, the former imparts its cold to the latter. The objections to this plan are the great cost of the ice and of handling it, the impossibility of getting as low a temperature as desirable (because the best result obtainable by this process is the mean of the two temperatures of the ice and water); the impossibility of obtaining an exact regular temperature continuously, and the fact that the ice being always more or less dirty renders the water so, and so soils the artificial butter and spoils its appearance.

The Pontifex machine overcomes these difficulties. Its cost of working is so small that an amount of cold equal to that produced by the melting of a ton of ice is obtained at a working cost of less than 1*s*.; from the moment it starts to work a continuous stream of ice-cold water of a steady even temperature as low as 32½° Fahr. (or ¼° Centigrade), if desired, is available; and the water coming in contact with nothing but the copper or brass tubes of the brine refrigerator leaves the machine as clean as it enters.

The machine itself has been previously described. A circulation of brine is pumped by the brine pump through the coils of pipes in the cooler and the ammonia gas cools this brine down to about 20° Fahr. In the churn room over the churns, or in any other convenient position, the ice water tank is fixed. Over this tank is fixed a patent copper or brass pipe brine refrigerator, consisting of horizontal rows of copper or brass pipes through which the circulation of cold brine is run, while over them the water to be cooled coming from the water company's mains at 55° to 65° Fahr. or any other temperature, is allowed to trickle, and in so doing it is cooled down to 32½° or 33° Fahr. by the brine inside the pipes, and after cooling runs into the ice water tank M, from which it is drawn as required for the use of the churns. The brine refrigerator is shown to a larger scale on the opposite page.

Some artificial butter makers are now using water cooled down only to 39° or 40° Fahr. In these cases the brine refrigerator is not required, the water to be cooled being simply run through the pipes in the cooler as in breweries.

The following is a table of the approximate quantities of water cooled by the Pontifix machine.

[In gallons per hour.]

Size of machines	B.	C.	D.	D 1.	E.	E 1.	F.	G.
Ice equivalent in tons melted per 24 hours	3	8	14	17	20	28	35	50
Fahrenheit.								
From 73 to 33	100	270	500	620	730	980	1,240	1,800
" 68 to 33	115	310	570	700	835	1,115	1,410	2,050
" 63 to 33	135	360	660	825	975	1,300	1,650	2,400
" 58 to 33	160	430	790	990	1,170	1,565	1,980	2,880
" 53 to 33	100	540	990	1,140	1,460	1,950	2,475	3,600
" 48 to 33	270	720	1,320	1,650	1,950	2,610	3,300	4,800
" 70 to 40	150	400	730	920	1,080	1,450	1,830	2,660
" 65 to 40	180	480	880	1,100	1,300	1,740	2,200	3,200
" 60 to 40	225	600	1,100	1,375	1,625	2,175	2,750	4,000
" 55 to 40	300	800	1,465	1,030	2,165	2,900	3,660	5,330
" 50 to 40	450	1,200	2,200	2,750	3,250	4,350	5,500	8,000

The following is an almost similar table reduced to the metric system.

[In liters per hour.]

Size of machines	B.	C.	D.	D 1.	E.	E 1.	F.	G.
Centigrade.								
From 24 to 1	445	1,186	2,173	2,692	3,211	4,259	5,434	7,905
" 21 to 1	511	1,363	2,500	3,097	3,693	4,899	6,249	9,090
" 18 to 1	602	1,604	2,941	3,648	4,345	5,763	7,352	10,694
" 15 to 1	730	1,948	3,571	4,424	5,276	6,998	8,928	12,986
" 12 to 1	929	2,479	4,541	5,630	6,715	8,907	11,363	16,528
" 9 to 1	1,278	3,409	6,250	7,742	9,233	12,247	15,624	22,727
" 22 to 5	668	1,783	3,268	4,048	4,822	6,404	8,169	11,883
" 19 to 5	811	2,164	3,968	4,915	5,862	7,775	9,920	14,429
" 16 to 5	1,033	2,754	5,050	6,256	7,461	9,896	12,626	18,364
" 12 to 5	1,623	4,328	7,936	9,831	11,724	15,551	19,841	28,859
" 11 to 5	1,304	5,050	9,259	11,469	13,678	18,143	23,147	33,366

PONTIFEX MACHINES FOR PARAFFIN OIL WORKS.

The Pontifex machine is specially advantageous for this purpose, not only on account of the great economy of the process, but particularly because the very low temperatures which can be maintained by it enable refiners to extract in the presses a far larger quantity of the valuable paraffin than can be obtained in any other way, and the quality of the oil separated is at the same time much improved.

Until recently ether machines have been largely used for this purpose, but the great difficulty with which by their use sufficiently low temperatures are obtained, and their very great reduction of sufficiency at these low temperatures, has caused them to be discarded in almost every case in favor of the Pontifex machine.

The illustration on the opposite page shows the most usual application of the Pontifex machine for paraffin oil cooling. The machine itself has been previously described. A circulation of brine is pumped by the brine pump through the coils of pipes in the cooler, and the ammonia gas cools this brine down to about zero, to 5° below zero Fahrenheit, or lower if desired. In an adjoining room are placed the cooling drums. Each drum consists of an open shallow trough in which revolves a hollow cast-iron or copper cylinder or drum. The oil to be cooled is placed in the trough. The surface of the drum in its revolution dips into this oil and becomes coated with a thin film of it, and is cooled by the circulation of cold brine from the machine, which is run through the drum by means of trunions with stuffing boxes at the ends. As the drum continues its revolution, the cooled oil is reduced to the temperature of 10° or 12° Fahrenheit, or to any other desired, and, in a pasty condition, is removed by a scraper, pressed against the side of the drum. The oil is then drawn away by plunger pumps and forced through filter presses which separate the paraffin wax crystals or scales from the oil.

In a new and improved apparatus the oil to be cooled is placed in large tanks provided with a number of vertical iron hollow walls or divisions. Through these hollow walls the circulation of brine is pumped, cooling down the oil in the spaces or chambers between them. After cooling, the oil is drawn away from the chambers by pumps and filtered as before. This plan is considered superior for several reasons, but chiefly because the oil having a much longer time to cool, the paraffin crystals or scales are formed very much larger, thus enabling the oil to be filtered more readily, and producing a larger quantity and better quality of wax and a better quality of oil.

PONTIFEX MACHINES FOR CHEMICAL WORKS.

Pontifex machines have been supplied to several chemical works, where they have been used chiefly for the reduction of mother liquors to low temperatures to increase the speed of crystallization, and the quantity of crystals produced. Also for the freezing of various chemicals and other purposes. The cold produced by the machine is usually imparted to a brine circulation which is used as a medium for reducing the temperature of the article to be cooled.

PONTIFEX MACHINES FOR BACON-CURING WORKS.

The Pontifex machines have been largely erected in bacon-curing factories, and their use in such is considered one of their most successful applications.

Originally the pigs after being killed were cooled simply by exposure to the atmospheric air, and afterwards cured in underground cellars at the temperature of the earth or 52° to 55° Fahr. These temperatures not being sufficiently low allowed of rapid decomposition and consequent taint in the bacon. To reduce this as far as possible, the bacon was charged with an excessive and objectionable amount of salt to preserve it. The public taste having latterly always moved in the direction of more and more mildly cured bacon, necessitated the artificial reduction of the temperature of the chill rooms and curing cellars. This has been usually accomplished by making the cellars with iron ceilings, above which were stored vast quantities—amounting in some cases to even thousands of tons of ice. This system was found very effective and is still largely in use; but it has many objections, of which the chief are (1) the large first cost of and amount of space occupied by the ice chambers, iron ceilings and their supports; (2) the great and continually recurring cost of the ice itself; (3) the cost and inconvenience of handling the ice; (4) the great risks ran and losses incurred when by any chance in the hot weather the supplies run short, and (5) the fact that the moisture rising in the air condenses against the underside of the iron ceiling and drips down on the bacon in process of curing.

The Pontifex system removes all these objections, and its application is so simple, powerful, and economical, and has proved in every respect so perfectly successful, that its universal adoption by the bacon trade in the United Kingdom is only a question of a very little time.

The illustration herewith shows the manner in which the Pontifex machine is applied in bacon factories. A circulation of brine (a solution of chloride of calciumin water) is pumped by the brine pump through the coils of pipes in the cooler and the ammonia gas cools this brine down to somewhere near its own temperature—say about 10° to 20° Fahr. or 22° to 12° of frost, or very much lower if desired. From this cooler cold brine flow and return mains are run through the factory to the chambers to be cooled. In the chill rooms and curing cellars rows of cast-iron flanged pipes are fixed overhead over the whole area, hanging from the ceiling; and through these pipes branch circulations of the cold brine are carried from the brine flow and return mains. This cold brine cools down the pipes to below freezing point, and the surfaces of the pipes cool the air in the rooms down to 40° Fahr., or any desired temperature. By means of cocks provided on the various branch mains, the speed of flow of brine through the various circulations, and consequently the temper-

ature of the rooms can be regulated and reduced or increased at pleasure. In ordinary working the machine is run in the day-time; and when it is stopped at night and on Sunday, and the curing cellars, etc., are closed up, the large amount of cold stored up in the brine in the pipes is generally found sufficient to keep the rooms down to the desired temperature until next morning. In very hot weather and in very large bacon factories the machine is generally run at night as well as day.

The chill or cooling rooms and the curing cellars are fitted up in the same manner; the only difference being that in the chill or cooling rooms, where the work to be done in cooling down the hot meat is greater in proportion to their size but intermittent, a proportionately larger number of brine pipes are placed, and the brine is turned on or off as the rooms are full or empty; while in the curing cellars, where the work to be done in proportion to their size is less but regular, a proportionately less number of brine pipes are placed, and the brine is always kept in circulation while the machine is running, maintaining a steady and perfectly even temperature.

The machine is fixed by preference on the ground floor near the the factory steam-boiler, and placed under the charge of the regular stoker or engine driver, so that excepting where there is more than one machine no special man is required to work it. No special steam-boiler is required, so little steam being wanted that it generally only means the stoker putting on the boiler fire an extra two or three shovelfuls of coal per hour.

The approximate cost of running the machines will be found to be usually actually less than ice if the latter could be bought at 1*s.* per ton. Thus an E machine doing the same amount of work as the melting of 10 tons of ice per twelve hours, costs 7*s.* per twelve hours to run; and a D machine doing the same amount of work as the melting of 7 tons of ice per twelve hours, costs 6*s.* per twelve hours to run; and these costs are only reached when coal costs as much as 20*s.* per ton.

No insulation or other preparation of the cooling or chill rooms or curing cellars is necessary; the chambers being taken just as they are and the brine pipes fitted up in sections without stopping the ordinary work.

In some factories the machines have been applied to cooling the curing cellars alone, leaving the chill or cooling rooms to be cooled by cold-air machines.

PONTIFEX MACHINES FOR COOLING STORES, AND FOR PRESERVING MEAT, FISH, FRUIT, ETC.

This has become a very important trade, and the Pontifex machine is particularly suited for the purpose.

A chamber of any required size can be kept at a uniform temperature of say 30° to 40° Fahr. (which is found to be the best temperature for preserving food), at a very small cost.

The great amount of labor and the considerable expense which the use of ice entails is thus avoided, as is the injury done to the keeping properties of food when it comes in contact with either ice or moist atmosphere.

By the Pontifex process a perfectly dry atmosphere can be obtained with the greatest facility, or, on the other hand, when fish, for instance, is to be stored which is injured by too dry an atmosphere the natural moisture can be retained by a simple modification of the arrangements.

The chambers can, if desired, be kept at a temperature as low as 30° or 40° below freezing, but for most descriptions of food it is found injurious to expose it to a temperature low enough to freeze, and thus burst the vesicles of which flesh, etc., is constructed.

Until lately cold-air machines have been used almost exclusively for the purpose of freezing and keeping meat frozen, but in consequence of the enormous cost of producing the cold, which requires quite fifteen to twenty times as much steam power and coals as the Pontifex machine to produce the same result, with a proportionately large extra charge for labor working the machines, oil, etc., the Pontifex machines are

now superseding the cold-air machines, on land where they are appliable. The Pontifex machines can not be used on shipboard, as they would not work properly if fixed on an unstable foundation.

The machine itself and its general arrangements are similar to those already described for bacon-curing works, with this alteration, that where exceedingly low temperatures are required as in the cases of stores for actually freezing meat and keeping it frozen, it is usually found desirable to fit up small wrought instead of large cast iron brine mains, as with the former the cold of the brine is more readily conducted through the thin metal of the pipes into the rooms.

PONTIFEX MACHINES FOR DISTILLERS.

These machines will be found of great value in hot weather to distillers, by keeping the spirit in the store tanks cool, thus effecting a great saving by avoiding the very considerable loss which occurs by evaporation.

PONTIFEX MACHINES FOR YEAST MERCHANTS.

The importance of the process to this trade is very large; the injury done to yeast and the disease set up in it by temperatures even only moderately warm, is well known. In consequence of this fact, the price in the market of German yeast rises fully 50 per cent. in warm weather.

PONTIFEX MACHINES FOR CHOCOLATE MANUFACTURERS.

For this purpose great advantages will be found by the use of this machine.

The cooling-room can be kept at a low temperature, and much waste saved by the rapid solidification which it renders possible, and also by the great advantage that the chocolate comes readily and perfect in shape out of the molds, and much fewer moulds are required to do the same amount of work.

For other works, too numerous to detail, this machine will also be found to be invaluable, both in facilitating and quickening the process employed, and also in enabling them to be carried on at a reduced cost.

THE PONTIFEX NEW PATENT IMPROVED AMMONIA PUMP.

The only parts of the Pontifex machine which move and therefore wear are the ammonia pumps. With a view of making these even less liable to give trouble than heretofore, Pontifex & Wood, Limited, have invented a new and greatly improved arrangement of pump which has been found to give the greatest possible satisfaction.

The illustrations on the opposite page show the new patent ammonia pump. Instead of being made as heretofore of the plunger type, and single acting, the new pump is made of the piston type and double-acting. Consequently, one pump throws double the quantity, and in a continuous stream, and each machine can do its full work with one pump only going. In addition to this, the place of the old pattern plunger of large diameter is taken by the new pattern piston-rod of very small diameter (only ¾ inch in the smallest and 1¼ inches in the largest pumps for corresponding machines), and the piston-rod gland being so small is very easily packed and kept tight, and the loss of ammonia in the ordinary working is almost entirely prevented.

These new pumps are so designed as to fit in the places of the old pumps on existing machines, on which Pontifex & Wood, Limited, strongly advise their adoption. These pumps are now put to all new machines.

SPARE PARTS AND FITTINGS.

The only parts of the Pontifex machines which wear are the ammonia pumps, which as already explained are in duplicate.

NEWCASTLE-UPON-TYNE.

REPORT BY CONSUL PUGH.

There is not a single refrigerator in use in the city of Newcastle, or, so far as I have been able to learn, in this district, in the sense in which the term is used in the United States, and about which information is sought.

The hotels and clubs use a small ice-box, crude in construction and of inferior capacity, but aside from these the refrigerator is not in use in any form.

This being a cool climate, butchers, poultry, fish, and game dealers have relied wholly upon the natural temperature for the preservation of their stocks, aiding nature simply by throwing the entire fronts of their rooms open during the day, and at night closing by means of open iron grating, thus securing a free circulation of air to all parts of the rooms.

By this means their meats are kept in comparatively salable condition without the use of ice or refrigerator, except on occasional hot days in summer, when a small per cent. of the dealers procure a small quantity of ice and place it on the benches and tables among the meats. However, a number of butchers in response to my questions have informed me that during the many years they had followed the business they had never bought a pound of ice.

As to interrogatory No. 5, I find the ice used here is imported from ports on the east side of the North Sea, principally Norway, at a cost of about $4.20 per ton in cargo lots, but the retail rate to the consumer is about 48 cents per 100 pounds.

The butchers, poultry, fish, and game dealers, recognizing the inconvenience of the present system, as it necessitated their carrying small stocks and occasioned frequent losses, have pretty universally agreed to adopt the plan of and have taken stock in the Northern Counties, Ice Making and Cold Stores Company, a prospectus of which is inclosed.

The necessity of some such plan as this, and the difficulty of introducing the American refrigerator, can only be appreciated by a knowledge of the diminutive quarters occupied by these dealers, the average size of which would not exceed 18 to 20 feet square; and yet this small room must accommodate counters, benches, scales, cutting-blocks, cash desk, stock, etc., with some little space for salesmen and customers.

A glance at any one of these will at once disclose the absolute want of space for a refrigerator of any valuable capacity.

The cold stores and ice company above alluded to was formed and stock apportioned long before the dispatch reached me, but in discussing the subject of refrigerators the members and officers of this com-

pany admit the importance and advantages of their use, and I therefore made to them this suggestion:

That as dealers in the outskirts of this city, those in the numerous surrounding towns, and especially those persons engaged in the very large fish trade at the mouth of the Tyne, would not be able to utilize the cold stores and become patrons of the ice company, and as they desired to extend the sale of their ice, would it not therefore be a good investment for the company to purchase a number of refrigerators of such size as could be used by dealers not accessible to their stores, furnish them to such persons at a stipulated rental and provide them with ice, thus extending their ice trade and making a profit off both ice and refrigerator?

The company appear to think it a good plan, at least in extending their ice trade and educating these dealers to the use of ice, and have asked me for estimates covering size, capacity, for both ice and meats, construction and costs, with a view to acting upon my suggestion.

I therefore suggest and recommend that our manufacturers forward to me their circulars and price-lists covering these points, to be placed before this company, or any persons whom I may be able to interest in the matter.

HORACE C. PUGH,
Consul.

UNITED STATES CONSULATE,
Newcastle-upon-Tyne, November 25, 1889.

PLYMOUTH.

REPORT BY CONSUL FOX.

Refrigerators are not much used in this district except by confectioners, hotel proprietors and purveyors, only few private families using them.

The ordinary chest or box refrigerator is mostly used.

Refrigerators are made in many sizes commencing at 22 inches wide, 20 deep, 29 high, and continuing as large as 50 by 34 inches. Ice safes and refrigerators are also made as large as 75 inches high, 39 wide, 27 deep.

Most of the ice used in this district is obtained from Norway and is retailed at about $4.86 to $14.48 per ton of 2,240 pounds. There is also a local ice company whose prices are about the same as above stated.

To introduce American refrigerators I can only suggest the establishment of an agency here for their sale.

THOMAS W. FOX,
Consul.

UNITED STATES CONSULATE,
Plymouth, January 2, 1890.

SHEFFIELD.

REPORT BY CONSUL FOLSOM.

The use of refrigerators in this consular district is exceedingly limited, as there is but little ice used. Dealers in ice here are the fishmongers and a few dealers in poultry, and hotel keepers employ small ones of a cheap class. I do not think the butchers use either ice or refrigerators and they are certainly unknown in private houses. Even in the summer iced drinks are considered a luxury, and in most places here a novelty.

The only peculiar requirement would be the keeping of a small block of ice for the longest possible time.

The most of the refrigerators in use are manufactured in London and Birmingham; a few, however, are manufactured by the Haslam Foundry Company, at Derby.

The few in use are small in size, not larger than those ordinarily found in private houses in the United States, and the prices of the same are not readily obtainable here.

Little or no ice is secured, and none to my knowledge is manufactured artificially. It is procured from Norway and Canada, and is sold, at retail, at about $1 per hundredweight of 112 pounds.

No doubt the use of refrigerators would be beneficial to the consumers of food, but the price of ice renders their use a luxury, and it is doubtful whether any successful introduction of the article could be made here except among a limited and wealthy class.

There is comparatively little hot or sultry weather experienced here, even in mid-summer, and but few precautions are taken for the preservation of foods and liquids. The former are bought in small quantities and the latter are kept in cellars where they retain a moderate degree of coldness. The inhabitants are so conservative in their views, and so disinclined to make radical changes in anything, that I doubt if even so useful, and to us so necessary, an article as the refrigerator could be successfully introduced.

It is possible, however, that something might be done in the way of introducing refrigerators of American manufacture through large commission houses—such, for instance, as that of W. B. Fordham & Sons, limited, 36 to 40 York Road, King's Cross, London.

BENJAMIN FOLSOM,
Consul.

UNITED STATES CONSULATE,
Sheffield, January 15, 1890.

SOUTHAMPTON.

REPORT BY CONSUL BRADLEY.

Refrigerators are extensively used in this consular district.

There are no peculiar features in the construction necessary to the requirements of this climate. Those in general use are manufactured in London.

The principle of construction does not differ materially from those made for the temperate regions of the United States, but are more unwieldy, and not so light and convenient, and as a general thing do not present a neat appearance for family use. The cheapest refrigerator costs $15 and is used for cooling wines and waters only. The best and largest refrigerator for family use costs $125.

There are intermediate sizes and prices, and all are designed to preserve meats, fish, and butter free from taint of foreign flavor.

The chief supply of ice is brought from Norway, and the price per 100 pounds is usually 60 cents. Ice is manufactured at Portsmouth, but in small quantities.

We have frequent communications with reference to the most successful method of introducing wares, and we usually reply that "by commission" is the best manner.

Owing to the proximity of this district to London, it is supplied by agents there, and not direct from the manufacturers, thereby increasing the price to consumers.

Presuming that an article of commerce will sell more quickly by being cheapened, I would say that manufacturers should reach a desired market direct if possible.

Our opinion, therefore, is that advertising matter should be furnished to the principal consular offices with power to designate a per centum off that will bring the article to a basis of desirability.

No doubt an agency might be established in each consular district in this manner.

I would suggest that if a suitable place were secured for the exposition of the articles of manufacture most likely to sell, in each consular district, it would be the most successful method of introducing articles of American manufacture, but the plan is not feasible because of the restriction placed upon consuls by the consular regulations.

Otherwise consular officers could give the matter most profitable attention.

I am of the opinion that American refrigerators would come into general use by reason of their cheapness and lightness.

JASPER P. BRADLEY,
Consul.

UNITED STATES CONSULATE,
Southampton, February 11, 1890.

IRELAND.

CORK.

REPORT OF CONSUL PIATT

Refrigerators are chiefly used in the dwellings of the wealthier classes of the people in this district, also in hotels, clubs, infirmaries, hospitals, etc., but only to a very limited extent. They are for the most part made at Birmingham, Sheffield, and other hardware manufacturing towns in England. They vary in size, the smaller ones being about 24 by 40 inches, having principally metal frames with zinc siding and roof perforated. The roof is oval in shape, forming a cone, at top of which is placed a wooden ball as ornament. These small refrigerators are suspended from a hook or spike under a shed or in some unexposed part of the house-yard at rear of kitchen. The price is from $2 to $2.50. The next size, similarly constructed, cost from $3.50 to $4.50. Larger ones, provided with shelves running through them, cost from $5 to $7.50, and rest on raised blocks or platforms.

The ice used in this district, where none is produced, is exclusively imported from Norway. There are but two firms or merchants in Cork who import whole cargoes of ice—one being a large bacon-curing establishment, which import it for their own use; the other imports cargoes for retail demand. About ten cargoes, averaging 500 tons each, are imported annually. The invoice price to the merchant is about $10 per ton, and it is sold retail at about 80 cents per 100 pounds. The price varies according to the season, it being sometimes in summer about $22 and in winter $14.60 per ton. Ice is secured or preserved for larger or wholesale uses in cellars fitted up specially for the purpose, large enough to contain several hundred tons. In households it is generally kept in wooden tubs, small barrels, or buckets covered over with sacks or cloth. Ice boxes or chests are not in use.

In households where refrigerators are not in use a surplus of food or liquids seldom accumulates, and ice is rarely used, except for medical purposes, as in cases of fever, etc.

For household purposes generally there does not appear to be any great need for refrigerators in this district, the supply of food and liquids being procured invariably tri-weekly. Again, the heat in summer seldom goes higher than 65°.

It is possible that refrigerators on an improved plan manufactured in America and put in the market at a cheaper price would find a sale—not directly, however, but through the English hardware centers. The demand here would not be sufficient for a direct trade with American manufacturers.

JOHN J. PIATT,
Consul.

UNITED STATES CONSULATE,
Cork, *July* 7, 1890.

DUBLIN.

REPORT BY CONSUL REID, OF DUBLIN.

Refrigerators are used in this consular district but to a very limited extent, and only in public and semi-public places. There are no peculiar features observed in the construction of those used here, except as noted below. As a rule, they are manufactured in the United States. The sizes and formation are not peculiar, while the prices are about the same as in the United States, with something added to cover the cost of transportation.

Ice in use in this district is brought from Norway and stored in ice-houses, from which such demand as there is is supplied. Occasional consumers pay nearly two cents per pound therefor. The price charged to season customers is about three-quarters of a cent per pound.

In further explanation of the foregoing answers, I have to say that the use of refrigerators in Ireland, even by the wealthy classes, is almost unknown outside of Dublin, Belfast, and Cork, except in hotels, in a few instances; and even in the larger cities the demand for them is very limited. They are in use only in hotels, cafés, etc.; very few private houses are provided with them. The reason for this is, first, that the extremes of temperature are very seldom, if ever, reached here. The mean annual temperature of the country is from 48° to 50°. The extreme of summer temperature is usually from 80° to 85°, but only a few days of each season are as warm as these figures indicate. In the winter, mercury only occasionally touches the freezing point. Secondly, because of the climatic conditions above mentioned, there is no ice produced in the country and but very little used —none at all in private houses. In fact, the need or want of it is but little felt. The breweries use machinery to establish a low degree of temperature for storage purposes.

Many of the refrigerators in use, being for special places and purposes, are made to order, and are stationary. Such limited general demands as exist in this line are supplied by refrigerators of American manufacture. I am so informed by the representatives of two firms in Dublin controlling whatever of trade there is in this direction. The particular kinds most in use here are the Alaska, manufactured by the Alaska Refrigerator Company, and the Belding, manufactured by the Belding Refrigerator Company. I am informed that the competition for the trade offered by British manufacturers is scarcely worth mentioning. The American manufacturers produce a much better article at a less price than British competitors offer.

As the best way of extending the refrigerator trade in this part of Ireland, I would recommend to parties or firms thus interested to correspond with Thomas McKenzie & Son, 212 and 213 Great Brunswick street, and John C. Parks, 110 and 111 Coombe, Dublin.

ALEX J. REID,
Consul.

U. S. CONSULATE,
DUBLIN, *January* 7, 1890.

SCOTLAND.

DUNFERMLINE.

REPORT BY COMMERCIAL AGENT REID.

Refrigerators, as understood in the United States, are unknown in this consular district.

Ice, in very limited quantities, is purchased in Edinburgh for the use of makers of ice-cream, and a still more limited extent by butchers, for a very short season in summer, for the preservation of meats.

The amount of consumption being well known, the killing of animals is regulated accordingly, and the cellars are always cool enough to render ice almost unnecessary. Price of ice per 100 pounds, 37 cents. Summer heat rarely exceeds 74° to 78°.

JAMES D. REID,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Dunfermline, February 4, 1890.

GLASGOW.

REPORT BY CONSUL BROWN.

In answer to the first interrogatory as to the use of refrigerators in this consular district, will say that they are used but to a very limited extent as compared with their use in the United States.

There are no peculiar features required in the construction of refrigerators for use in this district, unless it be that refrigerators with less heat-resisting power would answer here, where it is called excessively warm when the thermometer registers 70° to 80°. I may add, the latter point is rarely reached.

Some of the refrigerators in use here are manufactured in London, but, as far as I can learn, the larger and better ones are of American manufacture. I should add that there are no small refrigerators or next to none in use here. I have visited a number of small or medium sized meat and fishmonger shops, and in no case found a refrigerator. They have a device of their own in most cases, and quite crude and unscientific. Refrigerators for family use are practically unknown.

The few that are in use, for the most part, are built within the rooms occupied by them. Of the smaller sizes, such as would be kept in stock, I have been unable to find any, though I have made inquiry of several alleged dealers. The trade is so small that quotations of prices are impossible.

Ice is secured in this district mainly from Norway, though some is secured from lakes near the city (thin and of consequent poor quality), and a small amount manufactured. Ice from the Baltic is worth, de-

livered here, $6.32 per ton, and is retailed at 48 cents per 100 pounds. I have talked with many persons, and all unite in saying that a more general use of refrigerators is most desirable, but in this connection it must be borne in mind that the climate here is far from what Americans would call hot, and refrigerators are not absolutely and indispensably necessary.

It is believed, however, that if the people came to understand the luxury, not to say the essential need, of refrigerators that a demand for them would spring up at once.

It is the unanimous judgment of those with whom I have conversed upon the subject that a refrigerator which would consume a minimum quantity of ice and which could be placed upon the market at a reasonable price would surely find sale. As to the best method of introduction, I am not so sure. Persons making the attempt should bear in mind what I have said of the climate, price, and quality, and remember that the Scotch are a conservative people, and that any new thing, however meritorious, would need "pushing."

A live representative, with refrigerators to confirm his statements in actual use, would, I believe, in time, be successful in building up a trade which would yield ample returns.

L. W. BROWN,
Consul.

UNITED STATES CONSULATE,
Glasgow, January 21, 1890.

LEITH.

REPORT BY CONSUL BRUCE.

Refrigerators are not extensively used in this consular district. Only here and there a brewery, a butcher's establishment, a hotel, or a private house form exceptions to the general rule. The weather is too cool to make them necessary in domestic economy. Younger & Co., of Edinburgh, large ale brewers, have an extensive pipe cooler (see Inclosure A), the cooling of the ale being accomplished not by ice but by water of natural temperature running against the ale pipes in opposite direction.

The ice in the ordinary domestic refrigerator is placed in the bottom of the chest, and the box is fitted with sliding zinc shelves.

The refrigerators used here are manufactured for the most part in London, although joiners or carpenters in Edinburgh often make them, as they may be required.

The domestic refrigerator (see Inclosure B) in use here, and known in the trade as refrigerator or portable ice house, is a square box from 22 to 50 inches in height, length, and width, resembling a wooden cube, on feet that raise it a few inches from the floor. The price ranges from $15 to $50.

Ice is brought to Edinburgh and the west of Scotland from Norway, and is worth at the unlading of ship about 40 cents per 100 pounds, and ranges from 50 cents to 60 cents when retailed during the season from June to August. There is one ice manufactory in Edinburgh, but I have been advised that the business is not profitable to the proprietors. In a word, the climate here is so cool and equable, even in the three summer months, that there is not the need or demand for ice or refrigerators as in warmer climates. It is only now and then that one comes upon ice-water on draught, and it is not common upon the table as with our people in the United States.

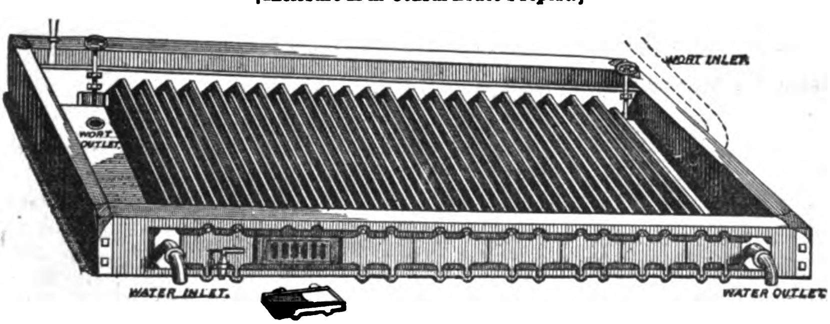
I also inclose herein a catalogue (illustrated) of "ice making and refrigerating machinery," recently published (marked Inclosure C), which will be of service in showing the kind of apparatus used in Great Britain.

WALLACE BRUCE,
Consul.

UNITED STATES CONSULATE,
Edinburgh, February 28, 1890.

Wort refrigerator, manufactured by Stewardson & Hodgson, 356 Leith Walk, Edinburgh.

[Inclosure A in Consul Bruce's report.]



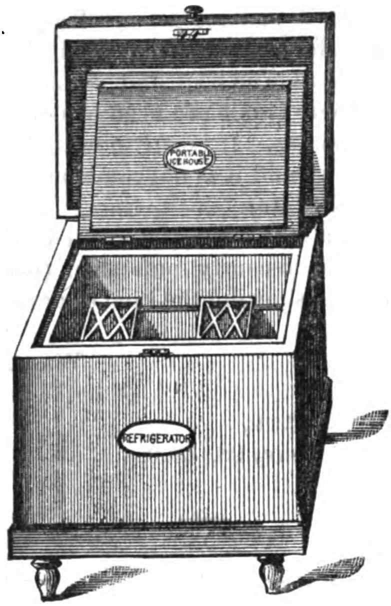
PRICES.

[Delivered f. o. b. or rail in Edinburgh.]

To cool 5 barrels per hour	£40	To cool 30 barrels per hour	£150
To cool 10 barrels per hour	70	To cool 35 barrels per hour	180
To cool 15 barrels per hour	90	To cool 40 barrels per hour	200
To cool 20 barrels per hour	110	To cool 50 barrels per hour	240
To cool 25 barrels per hour	130	To cool 60 barrels per hour	280

Refrigerator or portable ice house.

[Inclosure B in Consul Bruce's report.]



SIZES AND PRICES.

[Fitted with sliding zinc shelves, painted, grained, and varnished.]

This is the refrigerator said to be mostly in use in Leith and Edinburgh.

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SPECIAL CONSULAR REPORTS.

EUROPEAN EMIGRATION.

STUDIES IN EUROPE OF EMIGRATION MOVING OUT OF EUROPE, ESPECIALLY THAT FLOWING TO THE UNITED STATES.

MADE UNDER THE AUTHORITY OF THE DEPARTMENT OF STATE DURING THE YEAR ENDING OCTOBER 1, 1890,

BY F. L. DINGLEY.

ISSUED FROM THE BUREAU OF STATISTICS, DEPARTMENT OF STATE.

ALL REQUESTS FOR THESE REPORTS SHOULD BE ADDRESSED TO THE SECRETARY OF STATE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1890.

EUROPEAN EMIGRATION.

ITALIAN EMIGRATION.

Perhaps Italian emigration better than any other illustrates the fact that it is the geometric ratio rather than simple proportion which hunger and ambition invoke among the masses of the people in modern times when once the rivulet of emigration has been set in motion. A few years ago the Latin race in the United States was represented mainly by an occasional Italian, with his hand-organ and his monkey, or with his scissors-grinding wheel, a curiosity of population rather than a factor of the census. It is interesting to note how great results flow from causes in themselves apparently trivial. The organ-grinder, the harpist, the scissors-grinder, the proprietor of the monkey got on in the American world as he never got on in Italy. He sent word to his friends in Calabria, in the Basilicata, and in Salerno. His family was brought over; his cousins and his aunts followed. The movement at first was an obscure one. It takes time to create rivers; but the success of the forerunners really made the present stream of Italian emigration. I have asked scores of Italians in Naples, intending emigrants to the United States, "What leads you to emigrate?" The uniform substance of their reply is this: "My friend in America is doing well and he has sent for me."

The factors of organic evolution are two, appetite and affection. As Schiller says, "While philosophers are disputing about the government of the world, hunger and love are performing the task." The imposing movements of population in modern times obey the same law; they are as irrepressible as they are irreversible. The stream may be dammed or diverted, but can not be stopped. The wise legislator will not legislate against nature. He will seek to divert where he can not stay, to direct where he can not annihilate. The problem of Italian emigration is not to be solved by letting the emigrants drift, but by skillful manipulation of the factors of selection and education. The Latin race possesses intellectual and industrial qualities which will prove of value in fusion with American stock.

The logical genius of a people whose institutions and laws are the germs of modern government and law is potential even in its illiterates. Than the educated and disciplined Italian of Naples, Florence, Rome, or Geneva, few modern men or women are more conspicuous, whether we speak of mere size of hat, or of social or political development. Mod-

ern governments dawned in the independent cities of Italy in the Middle Ages.

The problem of emigration is not one of mechanism but one of character. Hence, of first importance is the character of the Italian who comes to our shores. To pursue this study best, we must repair to Naples; for Naples is the chief distributing point of the Italian races. From Naples, twenty great fleets of ocean steamers sail monthly to the East, while scores of steamships sail thence to other parts of the world. Naples is the cosmopolite of the southern races, Oriental and European—the great halting place between Europe and Asia where, as in the days of the Pentecost at Jerusalem, all races meet in an industrial symposium as they used to meet on the other side of the Mediterranean in religious symposia. The fez and the palm, the top-hat and the no-hat, Asia, Africa, and Italia, Armenians, Jews from Asia Minor, turbaned swarthy Indians, and kinky-haired Africans, climb into the steerage to-day hard by where Saint Paul entered on his wanderings twenty centuries ago. Let us then enter the lodging houses of Naples and climb into the steerage of the ships in the harbor of Naples and see what manner of persons are about exploiting the land which European emigrants first discovered and then possessed.

First, a visit to places where intending emigrants are thronging. Obviously, in this group of several hundred there is hardly one who ever has been a dweller in cities. They are families, more than individual adventurers, rustics, clad in homespun, faces brown, hands horny, vigorous in body, but if illiterate not stupid, if poor not paupers. These people are chiefly the peasant farmers of Calabria. I find in the group half a dozen who have been in the United States but who have returned for their families. One has sold his little home to raise funds for the journey; another has received a prepaid passage. Several do not know where the United States is located, but they think it is somewhere near New York. Later on we shall have more typical cases. Yet all these men apparently are intellectually above the average so far as native powers are concerned. You say, "They are not good citizens," but you add, "Are they not raw material for good citizens." The obvious reply is, too much raw material is politically indigestible. The point practical is to take as much as we can profitably assimilate. The prophet who can tell us where and when to draw the line, is the prophet the American Government apparently is waiting for. To shed light in this further question, if possible, let us look at the Calabrian peasantry a little more closely.

Here is the steamship *Britannia*, destined to sail to-morrow from Naples (the spring of 1890); she is lying near the quay in the harbor, surrounded by a fleet of small boats, loaded with emigrants, who have their household effects in bundles in their arms. It is an exodus not of political or of religious persecution; obviously the gospel of this movement seen in these half-fed faces is the gospel of want. Hunger, which

orientalized Europe, seeks now to fertilize the newest civilization with the oldest. There was never in politics so much bread and so little butter.

There are now 1,048 steerage emigrants on board the *Britannia.* A careful study of these will give us a clew to some of the hidden things of the Latin movement. At the entrance of the steerage on the upper deck of the ship sit Italian officials—the chief of police, the doctor, the captain of the ship. One by one the emigrants appear with their passports, are examined, questioned, their papers inspected, the sheep and goats separated. There is one goat among the 1,048 sheep and lambs. He is excluded for lying about his age. An obvious inconsistency exists between his papers and himself. His pockets are turned inside out; he is a farmer; has about 20 francs in money, a prayer-book, two old letters, and a ticket to New York; but he can not go. Two weeks later I shall see this same person crossing the frontier and going to New York via Havre. I said that it is hard to stop a stream but easy to divert one. This Neapolitan farmer is an illustration of how you may fail most when you fancy you are succeeding best in stifling freedom of individual movement.

The Italian Government does not want these Italian farmers to emigrate, and they have hedged them about with many restrictions which do not restrict. All able-bodied young men must first have served in the Italian army before emigration is possible—save by jumping the invisible fence that separates Italy from France. Hence one is not surprised to see that more Italians than Frenchmen emigrate from France. It is the law of the unexpected which emigration illuminates.

As the emigrants here on the deck of the *Britannia* file up one by one before the Italian Government officials, one gets the autobiography of each, and, by and by, interesting facts will trickle out in spite of shrewdest intentions to be reticent. There are triple guaranties for the protection of the emigrant, and one of these is in the hands of the police; the emigrant carries a second in his pocket; the emigrant agent carries another in his archives. These guaranties are a contract that the emigrant shall be honestly delivered to the port of New York; hitherto many Italians who thought they were bound for New York have woke up in the Argentine Republic. Thousands of emigrants have thus endured vast hardships in unexpected and undesired lands.

Very few of these Italian peasants can read or write; they can not even sign their names. I said the Italians emigrate also from France, and this ship calls at Marseilles, but she will take thence only two Frenchmen. The French do not emigrate. It is the Italians who now supply raw muscle for the Yankees. All the emigrants of the *Britannia's* list prove to have been vaccinated and in health. The chief of police sees in them no deserters from the army, no criminals that his gallery records. The emigration agent looks on with anxiety, because his commissions are

reduced by rejections, and violation of the law subjects him to heavy penalties. The police search the ship for stowaways.

The ship's steward displays the following bill of fare for the steerage passengers: Bread, biscuit, rice, macaroni, pea-soup, salt fish, potatoes, cheese, coffee, sugar, pickles, salt, and wine in fixed and supposedly proper qualities and quantities. If this bill of fare is materialized these 1,048 Italians should look less lank in New York twenty days later than they now do. On some lines the stewards wax rich by impositions, like charging 25 cents for a cup of coffee.

The women on their heads wear bright kerchiefs, brass jewelry in their ears, and they crouch on the deck upon their household effects which as a rule consist of one bundle. A group of unwashed children, quite young, almost invariably testify to the fact that the incipient stage of Italian emigration was long ago passed. The family is not the courier of emigration. When the children go we may regard that for better or worse; the emigrant is no longer an adventurer or a bird of passage, but for better or worse a coming citizen. These adults will pick up a little pigeon English in the United States; they will form a new *patois;* but these children, with the rare knack of universal infancy, will soon be speaking two languages with the facility of the ancient Romans, who had pentecostal gifts before they ever heard of pentecostal miracles.

We can not expect that any but the contingent of these emigrants that are on the juvenile list shall assimilate with Americans. Assimilation must be preceded by the gift of tongues, and men and women rarely learn to wag their tongues in new position after they are twenty-five years of age. Hence Italians of the first generation are less desirable as elements of our population than Anglo-Saxons of the first generation. We must wait awhile before dogmatically predicting the status of the Latin family in America after adoption has ended in assimilation.

This Italian mother is under thirty years of age; four children are frolicking in and about her lap beside one infant imbibing refreshment in instinctive Eden simplicity. The mother will meet her husband in New York. What is he doing in New York? Selling vegetables. He came over last winter to spend the cold months when vegetables on the street were impracticable. He returned in the spring; his family now follow him. I suppose that on this ship there are a dozen similarly conditioned families.

Another typical case: Here is one mother with two boys of ten and twelve years respectively. They have enough money to pay their passage less five lire; the benevolence of the ship prevails. They are allowed to pass on to Canaan. They will land in New York without a sou—not paupers in the sense of ever having been a public charge, but pitiably poor, with an American scissors-grinder, head of the family, between them and the poor-house. This poor woman cried bitterly for sorrow when she found she had not quite money enough to get to America. She cried for joy when the ship agent says, "Take 'em." I

am assured that many emigrants fall just a little short of the necessary passage-money as a diplomatic dodge, but such is the discriminating mind of shippers they generally are able to detect the counterfeit, and to separate the wheat from the chaff. But certain it is that hundreds of these Italians land in New York without a franc in their pockets. The more's their credit if they pick up a livelihood.

Here comes another type: His is a figure familiar to the emigrant agent and to the Neapolitan steam ship lines. For twelve years he has annually been seen returning from New York as the swallows homeward fly. He works "in the States" from April to December, returns to his Calabrian hut and his domestic gods each Christmas, stays till the Yankees begin to talk of more railroads, books again for the States; and so on in cycles of American toil and Italian moil. He says that it is cheaper for him to spend his money where he doesn't earn it. He may finally turn out to be a good American citizen, but not, I submit, until he has cost us more than he is probably worth.

Another citizen of no mean Italian city files before the inspector; he also has been in the United States before; he is returning to his "lodgings" in our country, which is not his continuing home; for he is also a pilgrim whose pilgrimage knows no end. What is his business? He is a harpist and has been playing his romances to Philadelphia for the past ten years, taking intermissions at summer resorts and on suburban steam-boats. He is now returning with his three children and contemplates permanent residence in our country, where he says he can make money and a living, which under present conditions of life in Italy he can not do in his native land.

Yet another is a skilled worker, a mason; has been ten years in New York; has returned to Italy for his family; gets $4.25 a day for his work in New York City. "What can you get here in Italy?" "About 60 cents a day," is his reply. He has five children destined to become American citizens.

Here is one Italian woman weeping copiously. She can not buy her passage and she is sent back to the quay. Probably a mysterious purse will yet spring out of her pitiful petticoats. Her grief, I am told, has a suspicious background, being too hysterical. Another says: "I have been in the United States and have come back for my brother's children; he is busy and he paid my fare. I am a preparer of glove leather; I get $12 a week in the United States; here in Italy I could get but 15 francs ($2.90) a week." He is an intelligent man and has picked up enough English to get on with.

All these emigrants are courteous and orderly. The adults are from thirty-five to forty years of age on an average. There are few men between twenty and thirty, for such are subjects of military duty; but 20 per cent. of the 1,000 on board the ship are below twenty years of age.

There is another type. He is a carpenter; has been over to America

twice; is now returning to Italy, where he has been for a year; gets $2.50 per day in New York; will stay in the United States a few years longer and then return to Italy and buy land.

Another is a barber; has a shop in New York city; has come back to Italy and married; is moving with his bride to the United States, where he intends permanent domicile.

A carpenter forty-two years of age has been in Cincinnati, Ohio, and is returning with his family to remain in the United States, where he can get on in the world.

Another is a shoveler, an old man, making his second trip—an Atlantic circuit-rider.

The next in sight is also a bird of passage, has been four years in the United States, "milking cows in Pennsylvania."

A suspect is examined and his assets are as follows: One biscuit, 1 bottle of wine, 60 cents, 2 pieces of soap, and a clean pocket-handkerchief. "He's afraid they'll rob him," remarked the Italians in the group. "I'm a poor man, I've had little food, I look older than I am, I'm a farmer;" so much he says with a pathetic tremor which carries sympathetic conviction mixed with intellectual doubt. He swears he is but twenty-three years of age. Trouble sometimes makes twenty-three look like forty. But not even his soap saved him. He is rejected. As he was helped ashore an Italian remarked: "He's afraid they're going to hang him."

It is not necessary to multiply examples. One is astonished to find so numerous a contingent of quasi-emigrants, of men shifting countries annually, many of whom, no doubt, eventually become permanently in touch with our soil.

I was able to find among these 1,075 emigrants not one dweller in an Italian city; all were peasants originally in Italy, but many of them had grown into trades in the United States. The ground that separates skilled from unskilled labor is not a gulf; machinery has simplified the passage. A machine is a short cut to semi-skilled labor for a mind of ordinary intelligence. Hence the tendency is for greater relative scarcity of unskilled labor. It is already easier to get a man to run a locomotive than to find a man who will hold a plow. It is not certain that Cincinnatus ever went back. The Irishman who said "America is a great place," was unique when he added: "All I have to do is to carry the bricks to the top of a five-story building, and a poor fellow is there who does all the work'."

Even most of his race now prefer the trowel to the hod, and as the Irish took the unskilled work off our hands a quarter of a century ago and the French Canadian came to relieve the Irish, it is now the Italians who have come to relieve the Canadian French. It is impossible to develop new countries, to open up new railways, to build new cities by skilled labor. New countries require a larger contingent of raw muscle than old countries. The Italian came because he was wanted;

he was wanted because he was needed; an irreversible law will serve notice on him to stay away, by and by—that is when hunger, which drives him from his own peninsula, menaces him in the New World. That time does not yet seem to have come. The law of demand and supply may be intercepted, but it can not be repealed any more than the law of gravitation.

Now let the agent of the Florio Rubatino Steamship line speak:

We send many ship loads of emigrants [says he] from Palermo, in Sicily, to the United States during the spring—about 500 a month. We sent one load to Boston last spring. To Boston also we sent two ship loads from Naples. We have had four sailings per month for the past year. Last season we sent about 2,000 per month to South America, but now we are forwarding only from 200 to 300 per month to the South American States. If there is a large family, we give free passage to the children. They take their clothing and all their little assets in a bag. One-third of our Italian emigrants come back to us, and return again to the New World. None who are sick or feeble are allowed to depart. The doctors forbid and passports are denied.

The Italian Government had trouble with the United States because we sent over objectionable persons, and both the Government of Italy and the steamship lines are now more cautious. I never have seen a case of leprosy. The Italian officers ask each emigrant what he is going to do abroad and what means he has to return if he has not work.

Many of the emigrants do not know South America or North America as separate countries; it is all America to them. We have many Swiss emigrants passing via Genoa to New York. We shipped 4,000 to 5,000 to New York and Boston in 1889. I think our emigrants will average to have 20 to 50 francs each after paying their passage.

Another ship bound from Naples to New York furnishes more types: Three tailors, city bound, three women, who have been in the United States before; one digger, one coal heaver, who crosses "the ocean ferry" often; one stonecutter, who has also been in United States, where he gets three times the present Italian wage of his class.

What amazes is the size of the countercurrent. Sometimes as many as 1,000 Italians came back from the United States to Naples in the month of December. In hard cold winters and in hard times this countercurrent is stronger than in mild seasons and in good business cycles. About one-tenth of all the Italian emigrants are men who have been in the States before. One may easily distinguish them from the raw recruits; they are more independent, cleaner, better clad, and better fed.

During the past season (since March, 1890) the current of emigration to the United States has been a sort of Niagara, because the South American craze has ruinously collapsed. The financial and political cyclones in those unhappy southern countries have stranded many of the Italians who went to South America in 1888 and in 1889. It does not take long to stop emigrants from dumping themselves from the frying pan into the fire. Hunger is bad, but starvation is worse. The thousands who took assisted passages have had experiences which horror

only can depict. Their story is a household word in Italy. The United States is El Dorado as never before.

It is seen that paradise with bad government is hell. But the agents of the steamship lines, who cover Italy as the locusts covered Egypt, are busy as ever. They paint the charms of big wages in the United States; they often induce the poor peasant to sell his cow and move on the United States. There is a good deal of emigration that is assisted by rhetoric as well as by logic. The flowers of rhetoric easily woo hunger. Hopeless poverty eagerly confides itself to the possibility of an improved economic condition. There are castles in Spain even for the Calabrian. In this business the commission money of clouds of emigrant agents is the chief inspiration. The ship would starve without steerage list; there is large profit in handling large numbers, and some thousands of drummers for emigrants swarm over Italy, and their fruit is in the 5,000 Italians who in one week of the recent spring cut loose from the life of the Italian peasantry to try chances in the United States Many more applied in the spring of 1890 than the ships could carry, though they were crammed like sardines in all the decks and in tiers three deep, as my eyes have witnessed—ships which I presume emptied their swarming cargoes on our shores, but which should never have been allowed to leave any port of a civilized state, or, once having left, to touch the civilization of any other State.

With proper consular oversight in Europe many of the evils of emigration might be remedied or checked. The best place to cure the evils of emigration is the place where these evils are generated. On this point more will be forthcoming later on.

There is a factor in Italian emigration which is larger and more important than perhaps any other European factor of its class. I allude to the devotion of nationality. The Irishman loves Ireland, the Englishmen loves England and the German loves Germany, but more intense than any of these loyalties is the devotion of the Italian to his ancient and now united State. This sentiment is as profound among the peasantry as among any class, and nothing but the most pressing poverty would drive the Italian people in such numbers from their native land. Hence, when they have made a few dollars in the United States beyond the present wants, they hasten to their old homes. Th love to spend their savings in Italy; it seems to them almost a sacrile to spend them elsewhere.

As a Chinaman's bones can never rest or his spirit be free until mortal remains are celestially interred, so an Italian peasant's doll seem to bring him real peace only when they are spent in the pl where he was born. The returning legions amaze the home peopl Italy with their financial resources; for men who never had a do look on $75 as a rich reserve, and $100 is wealth. These returned grants flourish about their native Italian towns and set their neigh hoods aflame with desire to see the land where even the shovel an

pick are transformed into gold. In this way Italian emigration is increased to no small extent, while prepaid passages yet further swell the stream.

How easily these emigrants fall into American manners one must have noted who has observed the effect of one or two years of American life on the abject and underfed Italian peasant. Between this adaptability on the one hand, and that intense nationality on the other hand, it can easily be seen that Italians who lose their grip of Italy will speedily get a powerful American bias. Their children at least are likely to be good citizens of the Republic, perhaps in many cases as valuable as the descendants of Gallic or Teuton stock, etc. Variety of stock must itself strengthen the race whose energies already express the best results of the combination of Northern races. As the Latin stock contributed not a little to German vigor, may not the same stock re-enforce the new nation on this side of the sea?

There unquestionably is conformity with the letter of the law of the United States prohibiting contract labor, but I judge by the enormous rush of pilgrims, who stay for brief periods, that in one way or another it is easy to conform to the letter and deplete the spirit. Yet on the whole, the law has done good, for it has enlightened the emigrant and forced the recruiting agents to exercise caution and to the choice of other bait.

The Italian beggars do not emigrate. The lazzaroni of Naples can not be induced to go elsewhere, for nowhere is life so easy, nowhere else can the hereditary loafer soak himself in merry sunshine all the day and be fed by ravens or other invisible agencies; for these idlers are uniformly fat without ever having done a stroke of work in the memory of man. As a rule the conditions of life in cities are such that dwellers therein do not migrate. Hunger moves the country, but the town seems to fascinate it. The movements of European populations in general are not at all from cities. If we get the illiterate emigrant we get also the bone and sinew of Europe. What manner of men and of women ensue depends in part on the environments which this country supplies.

The agent of the Anchor Line of steam-ships at Naples speaks thus:

Our agency here in Naples received $5,000 last winter from Italians in the United States for their families in Italy. Each autumn the remittances commence, and every mail swarms with them from November to March. I suppose 25 per cent. of this money is used by returning Italians or by "prepaids." The number of Italians who came back from the United States last winter was unusually large, but with few exceptions they returned last spring to America. There has been a very heavy emigration to the United States this year (1890), and there is likely to be another movement to the States this autumn. In autumn families begin to appear in large numbers to join their heads in America.

My impression is that Italians do not stop in New York now so generally, but they are scattering through the States, many of them in the country districts. All the emigrants are vaccinated before leaving Naples. We maintain a separate deck hospital but have small use for it. No lepers could pass our doctors; we never see a

leper. In 1888 we had cholera in the provinces of Italy but none in Naples, and we have had no cases since. Naples is in much better sanitary condition than a few years ago, because we now have as good a water system as any city in the world, an unlimited supply of the best of water, in place of the foul wells from which all our water was drawn until within a few years. The improvement in the health of the people was marked on the completion of our waterworks. Naples formerly was a notorious point for the distribution of disease, but I think its reputation in this respect is rapidly changing.

Italian emigrants move on South America from August until January. As many as twelve or fourteen steamers per month last year sailed from Genoa for South American ports, loaded with Italian emigrants, but the political disturbances have diminished the movement this year.

You get many Italian sailors in the United States, from Sorrento and other Italian ports.

The emigrating Italians are hard working classes, prudent, industrious, temperate, but ignorant and superstitious.

Many of them have this one object in life—to save money and buy a little land and cottage in Italy. Land in Italy is mainly owned in large blocks and landlords let land "at the halves." This makes the lot of the tenant a very hard one.

We ship quantities of macaroni from Naples to New York—about 20,000 boxes per month, and also many of the cheap wines of South Italy, with cheese—food and drink which the Italians in the United States consume. They naturally incline to live in the United States as they do at home, hence, so far as possible, they import what they eat in preference to consuming American products.

The standard of living of Italians is not as low as that of the Chinese but it is evident that it is far below that of our American workers. The second generation born on American soil tend more to a better diet.

The representative of the Anchor Line further remarks:

Of course we see in the ranks of our emigrants cases of apparent extreme poverty. Many have but a manila-sack full of assets, but they come back with water-proofs, trunks and shovels. They give us little trouble on board ship. Those who have been several times to the United States return and put on airs; they want to eat what formerly were luxuries, meats, especially, which they almost never saw in Italy on their tables. This is the effect of American life. They land in the United States with but a few lire in their pockets. They give you their work; they return with your money which they have made theirs.

No; people from town do not emigrate. The poor people can not be detached from cities. There are two causes, love of their city and the fact of absolute poverty. The Italian peasant is quite another person than the lazzaroni. The Italian workers are parsimonious; the lazzaroni never works. You in the United States get our better industrious lower class. We could not get our tramps to go if we wanted to. You will find an improvement in the Italian emigrant of the future, I think, because education in Italy is now compulsory as it is in most of European states to-day. All he younger ones can now read and write.

This year gold has been 300 per cent. premium in South America—hence thrice more have gone to the United States than otherwise would have happened.

There are in Naples swarms of emigrant agents whose business it is to paint the glory of the New World to the peasantry of the Old World, for a percentage. There are numbers of these agents who buy one hundred steerage tickets outright on private terms and then "peddle them out as they can light their chap." There is a regular commission of 6

per cent. on steerage passages; but I am told that smart agents manage to secure other perquisites.

One emigrant agent thus speaks:

All sorts of inducements are held out to win emigrants. The interior of Italy is well-covered with posters and other reading, and from the United States come influences which lead emigrants into the Southwest and West where heavy owners of land desire to build up new territory. Many Italians are now emigrating to Africa, now that South America is in distress.

It is hard to get your first emigrant to an entirely new country; but once get them started and they go like a flock of sheep. A few years ago the first man was shipped to Brazil, and soon large numbers followed; but by and by the emigrant agents secured cheaper rates to New York and they shipped a load ostensibly to Brazil, but the emigrants were amazed on getting into port to find they were in New York. Thus Italian emigration to the United States began in a swindle; but once started the stream grew into a river.

In the streets of Naples one sees a reproduction of the ancient Roman scribe—the public letter-writer. These scribes are especially busy with American correspondence—Italians writing by dictation to their friends in the United States.

About 10 per cent. of the emigration to the United States from the port of Naples is Sicilian. Small steamers bring over load after load from Palermo, twenty-four hours distant. The Sicilian emigrants are somewhat less desirable than the Italian. The Sicilians are more inclined to be quarrelsome, and steam-ship companies do not like them so well as Italians. They are a wilder lot. The Sicilians naturally choose a warm climate. Most of them go to New Orleans; they are mainly rustics and many of them are good farmers; for the South they will be valuable.

In 1888–'89 the Italian Government undertook to check the outward movement of its citizens, but the restriction laws were of little avail. The Italians, who are masters of finesse, found easy means of circumventing the laws. Add to that the natural tendency of men to eat forbidden fruit, and one may easily see how the love of liberty and the bias for the fruit of the tree of knowledge rather fattened on the stones which were legislatively substituted for bread. The Italian Government saw its mistake; by general consent the screws were loosened, and now emigration from Italy is practically free—after military service is performed.

The American consul at Naples speaks somewhat as follows:

The Italian authorities in Naples undertook to forbid emigration last year, but this year they are less rigid. One steamer left here recently with 1,250 in the steerage—90 per cent. of them farm laborers, which means common laborers with a certain knowledge of farming. They are not quarrelsome but extremely quiet, temperate, and frugal. There is but one passion which, as a rule, turns an Italian into a fiend. Aroused by jealousy he is on fire. Transportation does not change the Italian nature.

Many Italians apply at the consulate for assisted passages to the United States. This consulate includes the south of Italy.

The water supply of Naples comes from the Appenines, 35 miles distant, and that is

almost a guaranty against special danger to the United States from contagion at this point.

There are two banks in New York which have branches in Naples that advance money to emigrants and contract for labor, as I believe, though I think everything is done verbally and nothing on paper.

Formerly our Government had a medical examiner here in Naples, who, to my certain knowledge, in more than one case prevented the export of cholera to the United States. Now we have no medical examinations here that are under the control of the United States; we must rely only on the surgeon of the steamer, and since many steamers are arriving here each week from cholera-infected districts it is evident there is great danger of the plague here, and hence New York is imperiled. Next year unusual precautions should be employed, as the prospect is that cholera, now sporadic in Europe, may become diffused.

I have several times discovered the existence of epidemics here in Naples through the doctor who formerly served the United States Government here. But for him, acting entirely in his private capacity, I should have been in utter ignorance of the dangers. For example, when cholera last appeared in Naples we had a sporadic case or two that were hushed up. I got private information that the cases actually existed. I waited a day or two for absolute certainty, and then cabled our Government the fact.

* * * * * * *

Thus through the kindness of the doctor, who formerly had been in the service of our Government, I was enabled to protect our shores from the impending peril; for when the shipping agent came to me for a bill of health for his ship I replied: "My dispatch has gone to the Department of State at Washington; that Department now knows there is cholera in Naples; I can not give you a bill of health." The shipping agents stormed and protested. I could only reply: "I am managing this matter; I shall give you a foul bill. If you sail, you sail at your own risk."

From this statement it would seem to be an easy and safe inference that, especially in seasons of contagion at points of European embarkation for the United States, our Government should protect itself, not in New York or Boston, but in Naples, Genoa, in Hamburg, Antwerp, and Liverpool. It is much easier to prevent than to cure.

And while speaking of the prevention of epidemics, it should be added that one great peril is from infected clothing and from rags. It would seem that, especially when epidemics are prevailing in Europe, all clothing should be disinfected and all rags disinfected or prohibited, and these precautions ought to be enforced before the departure of ships from foreign ports to the United States, as a condition of the issuance of a bill of health. The outbreak of cholera in Spain the present year, it is stated, was due to the failure to disinfect—germs of a former epidemic having been buried but not obliterated.

In the Berlin House of Refuge for the Homeless all clothing is disinfected, newcomers being stripped and washed while the disinfection proceeds. If such precautions are found necessary in periods when pestilence does not obtrude itself, much more needful must it be in periods when cholera is within a few hours of points whence thousands of people are embarking each month for the New World.

Sicily is a danger point of cholera. In Catania on the east coast of Sicily cholera raged severely a few years ago.

Another authority says:

Italian emigrants to Mexico and Costa Rica have been similarly cheated by promises of private companies. The revelations of the testimony made to the Congressional committee in the United States, regarding the impositions on Italian emigrants led to the enactment of a law by the Italian Parliament, under which emigrant agents must be licensed and deposit $1,000 caution money. This law forbids any assistance to men liable to military service, to escaped convicts, or fugitives from justice or of minors, organ grinders, and peddlers. Fees to the emigrant agent from the emigrant are forbidden. There are guaranties for the protection of the emigrant on board ship, and no emigrant is allowed to contract to pay the price of his passage in personal service. Any emigrant can claim double the passage money if he can show that his passage is paid in part or wholly by any government or by an emigration society or colonization agent. Imprisonment and fine menace violators of the law. Shipowners, who violate the law, are subjected to heavy penalties.

About 85 per cent. of the emigration from Italy to the United States comes from southern Italy, including Sicily. The proportion of women and children annually increases, showing an increasing tendency to permanent residence in our country.

A representative of one of the steamship lines in Naples makes the following statement:

Our municipal authorities here require certificates against our landing emigrants in the United States helpless. Their return to Italy as paupers is forbidden, and a bond is exacted from the friends of the emigrant insuring that the pilgrim shall not be returned to Italy as a pauper. This arrangement would seem to tend to keep the poorest in Italy as the surety must sacrifice if the returning emigrant becomes a charge on Italian poor rates. What effect this regulation has to prevent the pauper Italian from returning to his native land is another question worthy passing attention.

"Look at yonder public works here in Naples," remarks a Neapolitan shipper, "and you will see how working men in Italian cities fare. This is their noon hour." They are lunching on a hunk of bread, a little garlic and water—no wine—perhaps an orange. This is their dinner. The people here now drink water.

The law of 1888 regulating emigration agents has reduced the number of emigration agents in Naples from 60 to 24, many of the former emissaries being unable to obtain the required $1,000 bonds. Of the branch houses of banks formerly engaged in handling contract and other objectionable labor, only one has furnished the required security. Agents now get 6 per cent. of the passage-money, which is from 70 to 130 lire for adults. There are two New York firms or banks with representatives or branches in Naples, which furnish transportation to emigrants who have no money, shipping them to New York, where places of refuge or employment is provided. There is no positive contract, but this business is none the less in violation of the spirit of the law of the United States. I estimate that about 10 per cent. of the emigrants from Naples are supplied with advance tickets by these two banks controlled by an Italian capitalist in New York.

From 85 to 90 per cent. of the Italian emigration is the peasantry from the land; the rest are tailors, shoemakers, and carpenters, but not as a rule first-class workmen.

Mr. Landis, of New Jersey, has 8,000 acres in vines and other crops operated by Italian peasants in the United States. He has been in Italy and Sicily the past year studying Italian methods of agriculture.

About 15 per cent. of the Italian emigrants to the United States return to Italy to spend the winter and see their families and also as a matter of economy, as the fare

for the round trip is put very low and they would have no employment, or only intermittent employment, in the dull season. Some of those who return to Italy in the fall are provided with tickets by the New York firm of Italians already spoken of.

I think about 10 per cent. of the emigration is paid for in the United States by prepaid tickets. This 10 per cent. is not made up of shiftless idlers, but of those who "can't make a ra ise," as we say. It is the interest of shipping agents and of contract ors not to send men who can't or won't work. The lazy and the stupid are barred out by the self-interest of those who want to promote emigration for selfish ends.

I have repeatedly noticed that the older emigrants are the ones most liable to become a public charge. They are not so contented; they learn no English; they are more ignorant; they are too old to change, while the younger ones who return to Naples are bright as your dollars made over, speaking your language and with your newspapers in their pockets. Italians are very quick to learn when young and they can see as far into a pocket-book as any people in the world. If they are easily led they are also easily misled.

The Italian authorities forbid children going to the United States without their parents, unless proof is forthcoming that their parents are already there. Persons of no occupation are prohibited from emigrating, but farm hands are construed to have a trade. The Italian government is anxious to avoid complications with the United States, and the Italian authorities appear anxious to avoid any international discourtesy. The United States Government is respected here in Europe far more than in 1861. Tramps, beggars, and such classes are prevented from emigrating by contract, by the interest of the Italian as well as by the prohibitions of the United States Government, by the self-interest of shippers and agents, and by their own poverty. The risk of having a loafer returned is not carelessly entered upon by the steamship lines.

I have had repeated proof of the fact that the moral influence of the return of a few, even a handful, of beggars, organ-grinders and contract laborers by the ships that carry them to the United States, is efficient.

Speaking of the matter of contagious disease in Naples, a Neapolitan remarks:

We are very cautious in this matter, and an illustration will show that we have good cause for caution. The ship *Alesia*, of the Fabre Line, was quarantined in New York and nine persons died of cholera. The American consul at Naples had refused her a bill of health. The ship's agents complained he was fussy, but she ended in cholera, in a long quarantine, said to have cost the ship 80,000 lire. Evidently it is less profitable to export cholera than Italians.

Yet another, an American resident in Naples, says:

My opinion is that the time will come when you will have all the Italians whom you can use without self-mutilation. If you put a few drops of impure water into a glass of pure water you may not observe any serious deterioration, but a good deal of the impure water will spoil the whole. So long as this Italian movement tends to develop American internal improvement without degenerating American labor and standards of living, all will be well; but let us beware we do not suffer the nuisance point to be reached.

The military laws of Italy work against us, tending to give us children who are a tax on our resources and men over thirty years of age, who have passed the most productive part of their physical life. The third son is not liable to military duty; but if young Italians are United States citizens and come back to Italy, they are liable to be snatched up and transferred to the army. After three years' service a young man goes into the Italian reserve, but even then he can not go abroad without a permit. Of course none, as a rule, being allowed to emigrate past sixty years, we get fewer of the very old, but we do not on that account secure the most desirable.

The total emigration from Naples to the United States in 1889 was 15,709. In the first three months of 1890 the total emigration was ten times larger than for the corresponding period of 1889. From Naples, during the first three months of 1890, there emigrated to the United States 12,636 Italians and Sicilians. The movement from Sicily has been rapidly increasing during the past few years. From Palermo in 1887 2,201 Sicilians embarked destined for the United States; in 1888 the number advanced to 3,713, while in 1889 it moved up to 6,017; while during the present year the number is likely to be as great or larger.

The American consul at Palermo, speaking of Sicilian emigrants, says:

> The Sicilian emigrants to the United States are generally rustic and of the lowest type of the Italian as to character and intelligence, few, if any, being able to read or write. They have not, as a rule, a cent of money after paying their fare. There is no contagion at this date in Sicily and leprosy is now unknown. Steamship companies pay a certain amount to brokers to induce persons to emigrate, their aim being to procure as many as the ship can accommodate, as in the case of cargo.
>
> With the exception of emigration brokers there are no other known means adopted to promote emigration in this district. Of course there are many passages prepaid by friends in the United States. There is no strictly pauper emigration from Sicilian poorhouses, so far as I can learn.

Passing from the south of Italy to the north, Genoa furnishes interesting subjects for study in connection with the movements of population. Genoa is the point of embarkation of emigrants to South America largely. The movement was enormous in 1888 and in 1889, but this year it has fallen off very materially. The consuls representing various countries in South America furnish me the following interesting data of the movement of the Italians in the directions indicated:

Year.	Adults.			Children.	Total.	Destination.			Total.
	First and second class.	Third class.				Brazil.	River Plate.	Chili and Peru.	
		Men.	Women						
1888	4,439	79,650	44,202	47,811	176,102	102,424	73,463	215	176,102
1889	3,680	66,634	21,579	20,361	112,254	16,975	95,152	127	112,254
1890, up to March 31	602	9,886	3,560	3,323	17,371	1,551	15,808	12	17,371

For 1888 and 1889 South America received more than four times more Italian emigrants than the United States; but in 1890 it is likely that the United States will receive as many emigrants from Italy as the South American States, and possibly more, inclusive of Sicilians.

There is no emigration to the United States from Genoa. The ships carrying passengers and emigrants to the United States from Italy clear only from Naples and Palermo. There has been no emigration to the United States from Genoa for years.

The consuls at Genoa representing Brazil, Chili, Paraguay, Uruguay, and the Argentine Republic, state that the Italian emigrants going to those States are mostly illiterate and of the unskilled laboring classes, with a few mechanics. The Government of Chili seems anxious to obtain such people in order further to develop the resources of that country, and to that end Chili advertises to pay seven-eighths of the emigrant's passage and either find them employment or give them a certain tract of land to cultivate on arrival at their destination. The money advanced to the emigrant must be repaid by him in two years in semi-annual payments without interest. The number of emigrants from Genoa to South America for three years preceding the record in the above table was as follows:

Year.	Men.	Women.	Children.	Total.
1885	44,632	13,021	13,047	70,700
1886	28,431	10,575	10,135	49,139
1887	55,697	21,089	21,089	97,875

Both of the above tables show a large contingent of families. More than half a million persons have left Italy within five years for South America through Genoa alone. Six large fleets of steamers have been employed in this business. The number of Italians who emigrated to South America in 1889 was as large as the aggregate of English, Irish, and German emigrants together in that year passing through Castle Garden, and in 1888 the Italian movement was comparatively as well as absolutely greater. It is evident that the Latin emigration to the Southern American continent is destined to important results if it continues at all as it has been progressing in the past five years. Already much of the river traffic in South America is in the hands of Italians, who, as a rule, are superior to the races that loiter life away in those Republics.

There is no emigration direct to the United States from Genoa, as already indicated, but there is somewhat of a movement of Italians through Genoa to other ports whence they embark for our country. For example, the agents of the French Transatlantic Steamship Company at Genoa the past five years have sold to Italians annually from 3,000 to 5,000 tickets for the United States, about 10 per cent. of which are prepaid in the United States. These emigrants are furnished with railway tickets to Modane, on the French frontier, where agents of the Transatlantic Company meet them, forward them thence to Havre, and from Havre to New York. It is possible that by this route many subjects of Italian military service slip out of Italy and find their way to Havre and thence to New York. The Italian emigrants via Havre are from the provinces of Piedmont, Lombardy, and Venice.

Genoa is the city to which all seekers from northern Italy after new homes flock, especially in the spring months. These pilgrims neither

look nor act as intelligent as the Genoese, who are the brightest of all Italian populations. The Genoese do not emigrate.

The Italian emigrants from Genoa leave Italy with the view of making money enough to return and start anew in Italy. Those emigrants who go to the United States from northern Italy through French and German ports as a rule are traders or peddlers, given to getting on with their wits. In shrewdness they equal any class of traders in the world. An old Genoese proverb embodies the outcome of their practical maxims. They say, "It takes six Jews to make one Genoese."

Yet the American consul at Genoa, alluding to the Italian emigration from the north of Italy to the United States, gives his judgment that the majority of these will be "desirable additions to our population," and he is confirmed in this opinion by personal acquaintance with Italians who have lived in California, New Orleans, and Memphis, who are now in fact "living under their own vines and fig trees in the town of their nativity." Evidently the allusion is to Italians who have made money enough in the United States to return and buy a part of Italy. Some observers might regard such cases as an illustration of the ability of Italians to get on in the world at our expense.

There is no evidence that in the consular district of Genoa padrones or others are engaged in importing Italians to the United States for speculative purposes. Our laws have had a healthful moral influence on emigration; they have made the agents more cautious; have driven the worst adventurers out of the business, assisted by Italian law; and, best of all, have enlightened the emigrants themselves.

The banking house of Dapples & Co., in Genoa, receive many orders from Cantoni & Co., New York, to remit small sums of money to certain people in southern Italy, but none are received for families in northern Italy. Sometimes a single letter from New York contains orders for remittances to thirty or more families.

Regarding Genoese emigration a representative of one of the steamship lines remarks:

The emigrants hence to South America generally engage in small farming or gardening in that country. Peru and the Argentine give emigrants land and other aid to start in life. These emigrants are not quarrelsome and make good citizens. The rates for emigrants to the United States via Havre are very low, the railways competing for the traffic as they do in the United States. It is argued that the roads can carry a ton of live freight that loads and unloads itself cheaper ton for ton than goods which have to be handled by railway porters and at railway expense. Hence Italians are moved across France, Germany, or Belgium at very low rates. The competition for emigrants is so active as to form a very important factor in swelling the numbers of emigrants.

Many seamen, masons, and gardeners go from the north of Italy to the United States. Italy has swarms of crude masons, as all the cabins, not to say all the houses, are built of stone, brick, or concrete.

Genoa has the spirit and push of northern cities. One thousand English steamers touch here or land cargo here every year. The province

is poor agriculturally, but through the port of Genoa nearly all the coal consumed in great sections of Italy comes from English mines. As a natural consequence of this great ocean traffic, at Genoa center people of all climes. It is said the city is never free from smallpox. Although there is no good reason, from its situation, why the city should be unhealthy, imported disease fills its hospitals and imparts a cosmopolitan variety to the ailments therein. Yet I could not learn that leprosy prevailed to any noteworthy extent.

Regarding the South American contingent, a Genoese emigrant agent remarks:

> These Italian peasants who pass through our hands, sell all they have in their native villages, to raise their passage money to South America. Sometimes they have 10 francs left over. They pay perhaps 200 francs to the agent; the ship gets 160 to 180 francs.

The American vice-consul says:

> We have small pox in Genoa much at times, notably two years and a half ago; but the pestilence is raging now but little. I have never heard of a case of leprosy in Genoa. Emigrants are vaccinated before sailing. The emigrants hence used to come from near the cities of Italy, but now they are almost wholly rustic. The children are better educated, as we have had compulsory education for five or six years. The Italian government is not so strict as formerly in its execution of the laws against emigration, because the authorities have discovered that a rigid enforcement of the prohibition drives Italian emigrants across the frontier and other countries get the benefit of transportation business. Many young men, it is said, cross the frontier on the sly, to evade military duty, and are next heard of in New York or San Francisco. This class almost never return.
>
> The Italians who go to South America generally expect to return; but many of them are unable to return, being bonded to the soil. They go to a climate much like Italy, and to a tongue which they can acquire much more easily than English on account of the Latin comradeship of Spanish and Italian. The emigrants who go to Brazil are not so well pleased, as the climate does not agree with them. The emigrants go as a rule to Buenos Ayres, Rio Platte, and Montevideo, and thence are dispatched into the interior. There are Italian societies which protect the emigrant who falls into distress in South America, and take care of him until he can get work. This Italian exodus began thirty years ago, but it was not extensive until ten years ago, since which date it has been very large. Formerly the emigrants went by sailing vessels, enduring great hardships. The emigration to South America the present year probably will be much smaller than for most of the years of the decade.

The exports of Italian products to South America naturally have increased immensely since 1880. At the quays great steamships are always being loaded for South American ports, carrying wines, macaroni, cheese, and other Italian products. One of the chief articles of export hence is vermouth.

A sketch of scenes on the quay at Genoa a few hours preceding the departure of an emigrant steamer for Buenos Ayres, is not without significance. Here, for instance, are two boys, smart and bright, going on their own hook to South America to seek their fortune. They are twelve and thirteen years of age respectively. All their property is contained in a dirty manila bag slung on their backs. One of them

reports that his father is at work in a distillery in Brazil. Their journey will consume about a month. They have each two or three francs in money.

A load of emigrants just from the country packed like cattle in fourth class cars, without seats, is arriving, and they swarm on the quay. The steamers do a profitable business. This ship is now loading with wine, macaroni, dried fruits, sulphur, olive oil, liquors, straw paper. This steamer will take 800 emigrants to Buenos Ayres beside heavy cargo. One of the emigrants has been in South America and is now returning. His story is somewhat as follows:

I have been at work in a brickyard. I have taken the contract to make brick at a fixed price per one thousand. I manage to make 15 to 20 francs a day. My family is here in Italy, but I shall not take them to South America, but shall return here, after I have made more money, to settle again in Italy. I have work all the year and work half a day each Sunday. The Italians in South America have to pay large prices for desirable land. Speculators filch lots of money out of the emigrants, but they give them plenty of time to pay for the land. For a small plot of land for garden near the cities about $125 is charged. Garden land farther from market sells at $40 or $50 for a half acre. The small farmers raise potatoes, wheat, maize, and onions. The land where I am does not need irrigation and is rich.

Bivouacked on the deck are groups of women and children, soaking bread in red wine and lunching amid their bundles and potted plants which they are taking with them to their new homes. Their poverty would be pathetic if they were not so happy in its midst.

The efforts of the South American nations to win emigrants by artificial means, by bounties, and other similar means, have resulted in creating a great movement, but as a rule it is a disappointing one for the emigrant. Want of stable government and institutions, want of a market for products, is the bane of agriculture in most of the South American States. There is plenty of land but no demand for the products of the farm outside of the farm. Hence farming is primitive, of necessity. Peru has made special effort in Great Britain, France, Belgium, Switzerland, Germany, Sweden, and Norway, as well as in Italy to secure colonies. The Government of Peru has spent as high as $100,000 a year to encourage emigration and distribute it on irrigated land owned by the nation. The government has distributed free passages; but the emigrants find themselves worse off in some respects than at home. One colony of Italians in Peru have had to fight for existence against the Indians and half-breeds. Peru gives 250,000 square meters of land to every able-bodied settler who will bring it into cultivation.

The value of stablity and of moral forces is overlooked, and hence South American immigrants as a rule want again to emigrate. Add to political chaos and social insecurity want of industrial diversity, and you have certain conditions far worse than those of the Old World, where stable government guarantees many of the essential conditions of happiness and prosperity. The service of society to man is far greater

than that of any man to society. In 1888 over 250,000 Italians returned from South American States to Italy, reflecting very forcibly the influence of the conditions that have already been outlined.

The Venetian province sends the largest contingent to the South American States. Cuneo, in Piedmont, on the French frontier, sends the largest temporary emigration, perhaps because at such points it is easy to run away from military duty.

A SIDE-LIGHT ON ITALIAN EMIGRATION.

I have already alluded to the presence in Italy, the present year, of Mr. Landis of New Jersey, a student of Italian agriculture and an exploiter of Italian energy in the United States. The following sketch of a conversation with him in Genoa is of interest because it sheds some light on the difficult problems of American life. The anomaly of starving or hungry and greatly congested metropolitan populations within a few hours of idle and productive land is a menace both social and industrial, and a menace especially in a free republic. The most populous square mile of territory in the civilized world is said to be that square mile in New York City which is the focus of Italian life in the United States. That they manage to subsist, some sociologists argue, vindicates the right to be there; but Mr. Landis's experiment seems to prove that life is more than subsistence, and that when congested populations will not go to the land, genial and successful means may be employed to bring the land to them.

As the problem of civilization at the opening of the present century was how to bring a loaf of bread and a hungry mouth into coincidence, the problem of the close of the century is how to bring to the land the hand which represents that hunger. Steam has made civilization metropolitan. Already about 33 per cent. of the population of the United States is urban and half of the balance seems baffled because it also can not be urban. The momentum of consolidation, of great capitalization, of massed manufacture is irresistible. Can anything be done to extend the domain and the variety of agriculture? Are small farms going out and must land monopoly come in? Momentous questions which threaten the governments of Europe can more easily be solved in the United States by avoiding the conditions which lead to land monopoly. It is possible that the operations of the Italians on land a few hours from New York may furnish a clue to the partial solution of a problem in advance of its existence. As will be seen Mr. Landis is an admirer of the Italians, it may be in excess; but I subjoin the substance of what he has to say:

There are 40,000 Italians in New York and 20,000 in Philadelphia, but it is said there is hardly an Italian prostitute in either city. The Italians have large families. In the settlement of Italians at Vineland, N. J., there is a population of about 1,000 Italians—from six to twelve persons to a family. There are in this Italian colony 200 owners of land. Their farms average about 20 acres each. I sold the land on

credit mainly. The occupants invariably pay for their places and get on well. Since 1871 these Italian families have averaged about $20 each in increase of wealth, so that to-day their industry since 1871 (a period of about twenty years) represents an aggregate of $400,000. There is not an Italian in my county in an almshouse; there is not an Italian beggar in the place. Many foreigners go to cities and stay there because they are unaware that cheap land is so near, not only New York, Baltimore, and Richmond, but so close to the great manufacturing towns of New England. In Vermont and Maine there are many idle farms, much unoccupied land available for production.

I am aware that New England is too cold for Italians; but it is just the place for Scandinavian emigration, not to say emigrants from the north of Europe in general. Small farms pay well in the Central and Northern and Eastern States. In New Jersey alone there are a million and a half of acres of uncultivated land that might be made to bud and blossom. The soil is sand and clay, the best fruit and vegetable land in the country. This soil grows sweet potatoes at small expense, fetching more per bushel than wheat. We grow 150 bushels of sweet potatoes to the acre, while 20 bushels of wheat is a fair average per acre.

I make bold to say that there are fifty millions of acres of land available for garden crops, vegetables, and fruit, located within available market distance of New York, Boston, Philadelphia, Baltimore, and Washington. The idle population of our cities don't believe it; don't know it; and yet four-fifths of them were raised on the farms of Europe. The immigrant is quite unaware that there is any chance to get at the land east of the Wild West.

The Italians are chaste, industrious, and saving. They have good blood. They are clean farmers, painstaking, and know how to make both ends meet and lap over. They grow peppers, radishes, early onions, and so on for the New York market; they can't get such crops in the West, or if they did, they wouldn't find anybody to eat them. There is nothing for the poor man in wheat farming. Big farms and machinery for bread; but small farms and hands for dessert. Twenty bushels of wheat at 40 cents a bushel is starvation for the poor man. Rich men can farm on low prices for cereals but none others. The poor man's future on the land lies in painstaking care of small plantations that give variety and interest to the dinner table. The Italians are successful because they understand small farming, the vine, fruit-growing, economy of manures and clean culture. They have wisdom as to soils and crops, and take off two and sometimes three crops a year in succession. Behind them they have 30 centuries of agricultural experience. They waste nothing. The apples which others turn over to swine or suffer to rot under the trees, are daily pared and dried under the trees. They cultivate no weeds, but use all their land. The twigs which they prune from the trees are burned or buried by the roots of their vines to feed the grape crop.

You may well imagine that the aggregate product of these 4,000 acres cultivated by this Italian colony in Vineland is enormous. The colony give the police no trouble. There are no brawls, nor does drunkenness prevail among them. They speak English, the children, as a rule, fluently; and they become citizens and vote—some one ticket, some another, though the Democrats work them most. If the States which have idle lands should put into the hands of emigrants arriving in New York a fair statement of opportunities for settlers, I believe the congestion of population in our cities would be relieved, and the dangers of land monopoly further removed.

Take the history of Vineland, in New Jersey, as an illustration of what may be accomplished in the direction indicated: A quarter of a century ago I bought (continues Mr. Landis) 72,000 acres of land in New Jersey. People forget that it is the best land which is likely to be used last, because the best land can only be made available by spending money upon it, underdraining and sweetening. I took these 72,000 acres of land and put 14 miles of canals throught, it for drainage. Soon in one center, a manufacturing settlement sprang up with fifty-three distinct enterprises, supporting a population of 6,000 persons. There are now twenty schoolhouses at

that center, a boys' college, and to-day a population of 12,000 may be found where twenty-five years ago there was a wilderness, groaning for a John Baptist of industrial prerogatives.

The country produces not only good crops, but furnishes the material, sand, and clay beside each other, for brick. From twelve to sixteen cars, in the fruit season, are daily loaded and forwarded to New York—berries, peaches, apricots, in their succession. It is a great poultry and egg producing region.

The lesson of my journey in Italy is that the Italians are good farmers, steady, sober, and industrious. The sense of art, which is powerful in the Latin race, crops out even in their agriculture. I call them beautiful farmers. Their cottages are tastefully treated and their interiors are attractive; their agricultural utensils are primitive, but they move forward on touching land in the new world. One-half the Italians in the Vineland settlement can read and write. The women, as a rule, are handsome.

There is five to ten times more profit in small farming near large cities than in large farming in the west, dollar for dollar; and they need not shrink in the presence of competition; for that makes people reasonable, just, and sensible in affairs. The Italians in Vineland were not swarmed; they came family by family; one attracted another; they were not selected but self-selected. In Vineland about 400,000 gallons of wine are now produced annually by Italian and other farmers, and these small farmers manage each to save on an average $250 to $300 a year. They used to work in Italy even into the night; now they have shorter days and a surplus instead of long days and hunger.

The ease with which foreigners coming to this country, mix with our population is forcibly proved as every ship arrives in our ports. One may see the Italian scissors-grinder set up business five minutes after touching our shores. If he has any impressions of America, he does not stop to write a book before proceeding to business. He is unimpeded by baggage, and has nothing to bother him except his apparatus for putting an edge on things. Light-hearted and gay, he does not bother himself with looking for a boarding house, but oils up his machine, rings his bell, and calls into his empty pocket the dimes of the New World. He gives the police no trouble; the criminal statistics of New York City show a diminution in the arrests of foreigners—only 794 Italians out of a total of 20,000 arrests in the last quarter of 1889—and these mainly for petty offences. Of these 794 arrests of Italians, but 17 were women. The Italians of New York City, in some respects, may not be a very desirable fraction of the population, but it does not appear to be disorderly or dangerous. The little knowledge of the anarchist is more dangerous than the industrious ignorance of the Latin race.

The age of steam and of electricity has thrust upon the brawn of the world so many novel burdens and on its brain so many weighty questions that both muscle and nerve are in dilemmas. The number of Italians in New York City is larger than the army that achieved American independence. Prior to the war of the rebellion an Italian was a curiosity in American populations. The disappearance of servile labor from the United States was a loud call to European masses, and they heard the call. In 1875 there were almost no Italian emigrants to this country; in 1888 alone, nearly 200,000 Italians swarmed to our shores. In some years as many as 100,000 Italians have returned to Italy from

this country, but in many cases only again to reappear on our shores with their wives and children. The tendency, however, is to diminish return passages from this country to Italy. In 1888 there were but 6,331 immigrants migrating to Italy, while in the same year nearly a quarter of a million of the same people left South America for their old homes.

The severe agricultural conditions in Italy are not the only cause of Italian emigration. Overpopulation is an active cause. Italy is the most populous country in Europe, and 30 per cent. more populous than France or Austria. Italy in recent years has sent to the United States about the same ratio of emigrants to population as Great Britain and Ireland, but more than three times more than the German ratio, yet Italy is sending to all foreign countries less than 33 per cent. of her natural gain of population in excess of births over deaths; in other words, Italy is parting with a quarter of a million of her people, more or less, annually, and yet is increasing in population half a million a year. This looks as if emigration is not the remedy for overpopulation. It is likely, as the pressure of population is an important cause of wars, that the exodus from the Old World to the New is a chief source of the unexpected delay in the tremendous conflict for which European states have been getting ready since the close of the Franco-Prussian war.

The population of Italy is about half as large as that of the United States in a territory matched by single States of our Union. The largest permanent emigration is from the Province of Turin. From Lombardy permanent emigration also tends to increase. Calabrian emigration also increases, but arrivals from Tuscany are diminishing. It is an interesting fact that hardly an emigrant in the United States is from Latium. Rome sends us absolutely no Romans, old or young. It is a fact suggestive of the powerful hold on the cellars and attics of crowded European cities, that, although Naples is the most densely populated city in Europe, many a village of Calabria sends to the United States more emigrants. This is the average of the metropolitan movement from Italy: Rome, none; Venice, none; Naples, 800; Turin, 1,500; Genoa, 180, annually, to all points. It is not the cities which are contributing to the cities. It is the world's land that, for one reason or another, is forsaken. The fall in the prices of agricultural products, it is evident, is not an adequate reason if it be one reason; steam and electricity, gregariousness and concentration, consolidation and big fish, are among other causes conspiring to impose setbacks on country life.

The promotion of small farming is both an economic and a social obligation, and legislation in harmony with natural law for the improvement of the conditions of rural life, it would seem, is one of the imperative duties of contemporary lawmaking bodies. The problem of immigration grows more perplexing as farms grow larger. The industrious and honorable emigrant becomes a valuable addition to the national

economy as farms grow smaller. By the best utilization of man nature gives back the most, and equality tends to supplant inequality or justice to follow injustice in the distribution of wealth. If we allow the problem to grow more and more complicated, ere many years all political questions will have become economic and class bias will menace both political and industrial order. There are advantages in small farming in an epoch of concentration and steam, because chickens can not be made by machinery, and hence the legislator on the side of rural life has nature with him.

The Japanese have a proverb like this: "The more you know of earthquakes the less you like being left alone with one." In nature the throes are unavoidable. In economic and social life the political seismometer is prophetic and one may prevent by wisdom the catastrophe which unwisdom precipitates. The more one knows of the anarchic forces that menace European society the less he cares to be left alone with them. Sitting on the safety valve while combustion increases is not the wisdom of business. The safety of modern states is in fact the maintenance of a healthy proportion between urban and rural life. Small farms have saved France from chaos. They are to-day the groundwork of our republican stability. Remove the stimulus to ownership of land and you remove the incentive to effort. The man who owns a house and 20 acres of land never becomes a propagandist of the pernicious heresies which to-day are honeycombing Germany and Italy especially. Our homestead law was fine wisdom; but students of legislation can find no more important field for useful study than the study of the problem of the successful propagation of 20-acre farms in the United States. There is no limit yet in sight to the productive capacity of an acre of land; the author of "Twenty Acres Enough" was wiser in his generation than many of us are in our regeneration.

FRENCH EMIGRATION.

The famous chapter on "Snakes in Ireland," which began and ended with the declaration, "There are no snakes in Ireland," might well be substituted with the necessary verbal changes for a chapter on French emigration. But two ports in France are conspicuous as ports of departure for emigrants, and from these ports the great majority of departures are of nationalities other than French. The fact that France is the only country in Europe conspicuous for small farms, no doubt, has a close connection with the contentment of French agricultural population, which is a unique fact in European life—discontent being the chief course of emigration. French cities send few emigrants, in this respect resembling all other cities. Paris possesses the most varied industry of any city on the globe, but it is a mistake to say that Paris is France. The French peasant and farming class is France, whether there are bills to pay for a new war, or an indemnity for an old war, or public credit and prosperity to maintain. In small farms and diversity of industry reposes the stability of French civilization in the midst of political fermentations.

From Havre in France about 25,000 emigrants annually sail for the United States, and only about 10 per cent. of these are French. From Marseilles from 3,000 to 4,000 sail annually for our country, and only a handful of these are French. The Italian emigrants are in a great majority both from Marseilles and from Havre. A more particular study of the statistics is of interest:

Emigration from Marseilles.

Nationality.	1888.	1889.	Total.	Nationality.	1888.	1889.	Total.
Italians	2,290	1,491	3,781	English	10	5	15
Syrians	487	942	1,429	Swiss	17	12	29
Russians	52	37	89	Egyptians	7	1	8
Turks	20	73	93	Roumanians	....	38	38
Greeks	405	98	503	Portuguese	....	2	2
Spaniards	21	16	37	Belgians	7	1	8
Armenians	65	207	272	Poles	....	2	2
Americans	15	38	53				
Austrians	11	21	32	Total	3,415	2,987	6,402
Germans	8	3	11				

Emigration from Marseilles—Continued.

DESTINATION OF EMIGRANTS.

Year.	French.					Total.	Foreigners.								Total.
	New York.	San Francisco.	Quebec.	New Orleans.	Boston.		New York.	San Francisco.	New Orleans.	Chicago.	Quebec.	Baltimore.	Boston.	Philadelphia.	
1888	53	2	....	2	6	63	2,730	37	508	79	....	50	11	......	3,415
1889	44	2	....	10	1	57	2,298	7	47	16	....	34	6	579	2,987
Total	97	4	....	12	7	120	5,028	44	555	95	....	84	17	579	6,402

Occupation.	No.	Occupation.	No.	Occupation.	No.
Horticulturists	183	Bricklayers	82	Day-laborers	1,415
Coopers	89	Blacksmiths	97	Clerks	362
Shoemakers	271	Stokers	82	Wheelwrights	83
Agriculturists	634	Navvies	548	Miners	427
Coachmen	17	Bakers	53	Fitters	42
Cooks	41	Painters	27	Housekeepers	203
Tailors	62	Weavers	31	Without trade	1,257
Joiners	71	Carpenters	82		
Machinists	147	Locksmiths	54	Total	6,522
Masons	......	Cabinetmakers	41		
Butchers	17	Lithographers	32		

SEX—DIVISIONS.

Year.	Men.	Women.	Children.	Total.
1888	2,895	307	263	3,465
1889	2,300	412	255	3,057
Total	5,285	719	518	6,522

Perhaps the most discouraging feature of the statistics from Marseilles is the decided increase in the oriental movement—Syrians and Armenians. If that movement should continue to increase at the percentage of increase for the past two years it would steal upon us with disagreeable surprises like that which it was found necessary to checkmate from China. There is almost no French emigration from Marseilles, less than 2 per cent. of the emigration from that port being French. The strong predominance of Italians and of men in the list of emigrants from Marseilles indicates that the military refugees of Italy find Marseilles a convenient point of flight.

An encouraging feature of the emigration statistics from France, on the contrary, is the fact that about 50 per cent. of those, at least, who sail from Marseilles are men of skilled or half skilled trades, and that in great variety.

The total emigration of French to this country in 1889 was but 2,827, exclusive of first and second cabin passengers, who probably would swell the aggregate to 4,000. It is evident that the question of French

emigration from France is of small importance to this country compared with the increasing French emigration from Canada. For example, in 1890, about seventeen thousand French Canadians passed through Island Pond, Vt., the chief point of emigrant passage on our Canadian frontier; that is, we get more than four times more French emigrants from our English neighbors on this side of the sea than we do from France on the other side of the sea.

From Havre the following more detailed statement is of interest in this connection. The emigration to the United States from Havre in 1889 was 25,083; in the first five months of 1890 it was 14,073, indicating no great variation from that of 1889. The emigration of 1889 consisted of 2,770 French, and 22,383 of other nationalities. A few of these emigrants went from Havre to New York via England, but most of them sailed by the French steamship line direct from Havre to New York.

Very little if any contract or pauper emigration to the United States is discoverable in the French ports. The strong impression in Europe in general is that the United States is not the normal home of tramps. Our legislation and the occasional return of prohibited emigrants are well understood among the poorest classes in Europe. The French anarchists are not so inclined to leave France as Germany, and the retirement of Bismarck is likely to diminish the Teutonic movement of this class of people, in the absence of further extension of the German anti-Socialist laws. The chief bait for emigration through French ports is low steerage quotations in combination with cheap overland rates.

There is no indication that the Mormons are doing any recruiting work either in Italy, France, or Germany.

The risks of contagious diseases reaching the United States from Havre are trifling; from Marseilles they are more grave. Leprosy hardly has an existence in France to-day.

The emigrants from Havre as a rule are a young and healthy class, men being in great majority and laborers from the north of Italy predominating. Many of the emigrants, particularly the French, carry with them $150 to $250 to start in life on in the New World.

It will be found important, I think, if accurate statistical information is desired concerning foreign immigration, to pay more attention in the future to the second and first cabin. Hitherto we have counted the steerage or third-class only, but there are coming to our shores a very thrifty and valuable class of emigrants from all parts of Europe in the second cabin, and a limited number in the first cabin also. In my account of Dutch and German emigration this fact will be illustrated, but it is also illustrated in French emigration. On the other hand, many American sailors and some unfortunate or economical travelers seek the steerage passage to the United States. Last year in the emigration statistics from Havre were included nearly 1,300 Americans, mainly working-men and mechanics in care of the American exhibits at the Paris Ex-

position; but of course this factor of the statistics for 1889 is exceptional. In 1889 the French steamship line from Havre to New York carried 9,830 first and second class passengers from Havre to New York City, none of whom appear in the emigrant statistics, though unquestionably at least a small per cent. of them belong therein.

This glance at French emigration would be wholly inadequate, however, if mention of the emigration from Havre to points outside the United States were omitted. In 1889 the total emigration from Havre to all points was 49,856. Of these 11,728 sailed to the Argentine Republic, and 617 to Brazil, while Canada got but 239. More than two-thirds of the French emigration in 1889 went to South America, encouraged by the advances of passage-money and by promises made by the agencies established by the Argentine Republic in France. The business of transporting emigrants from Havre employed in 1889 169 steamships—114 French, 47 German, and 8 British. These vessels sailed as follows:

New York	90
Brazil	32
Buenos Ayres	31
Colon (Aspinwall)	9
Canada (via Liverpool)	7
Total	169

In this connection further details of the French Canadian movement are timely. Our collector of customs at Island Pond, Vt., estimates that the French Canadians passing our frontier through Vermont from Canada the present year will be about 17,000 and he believes that about 16 per cent. at least, of these will return to Canada, having no intention of becoming permanent residents. This was true, as a rule, of French Canadian emigration at the outset but the tendency is for an increasingly large percentage of them to become permanent dwellers in our country, in the manufacturing cities of New England especially. Most of the French Canadians leave Canada on account of the pressure of poverty and they probably will not average to possess 5 per cent of the purse when they enter the United States which they possess on returning to Canada. Five dollars is probably the average money which the French Canadians possess on entering the United States. Practically all the French Canadian emigration enters American territory via the Vermont district. The past year about 8,000 emigrants other than French Canadians have entered the United States from Canada through the collection district of Vermont.

In France population is now nearly stationary, but the cities even of France are growing in population, while in the rural districts population is slowly receding. Of course in these facts lies one explanation of the paucity of French emigration as well as of the difficulties in the way of French colonization to which France is now looking to cure the mischiefs of declining exports. Everything is now being manufactured all over Europe. France is in a position alone to make shoes enough

for the whole human race. They who want to make shoes are in great disproportion to those who want to wear shoes. The magic of manufacture by steam and invention outdoes the prodigies of the Aladdin lamp. It is in the better development of the land that safety of commerce and the security of States resides. Cities are civilizers, but countries are humanizers. It is a touch of nature that makes all the world kin. Landlordism repudiates nature. Titled foreigners now own 21,000,000 acres of land in the United States, besides vast tracts owned by untitled foreigners and great American proprietors. If we are going to have the small farms of France and of New England in the West and in the Southwest, and development along healthy and normal lines, we can not leave things to drift, for the drift of all the ages hitherto as to land has been anti-social, anti-republican and landlordly.

France furnishes a unique example of cosmopolitan tendencies. Her population in the last ten years has increased by about a million, of which 777,000 came from other parts of Europe, so that the French, like the Americans, tend to become an amalgam of English, Germans, Flemings, Italians, and Spaniards on a French base. French families are the smallest in Europe. There are more additions to the French by immigration than by birth. French manufactures were upbuilt under Colbert by importing skilled workmen from other parts of Europe. The foreigner really is at the basis of French superiority in manufactures; for the policy of assembling the best workmen in France has instructed the best workmen. The foreigner upbuilt English manufactures, and French religious exiles founded the linen industry in Ireland. France saved herself industrially by importing skilled labor and later on by religious persecution forced an emigration which proved as much of a blessing to other lands as her immigration had proved to France. Impertinence toward intelligent labor, native or foreign, is a grave economic blunder.

The French Government is neutral, so far as its official policy concerns emigration, but its indirect influence on the press reënforced by public opinion, is toward the discouragement of emigration. Discouraging reports from foreign countries get extensive circulation and the worst side of things abroad is emphasized. France each year seems disposed more and more to encourage immigration. There is some friction between the French and Italians in French cities, as the latter are taking possession of the field of unskilled labor, particularly in Marseilles, where it is estimated there are 60,000 Italians (about as many as in New York City) who live cheaper and work at lower rates than the natives. Italians in France work for about 50 cents per day and live on Indian meal, bread and vegetables. Wages in general are about half as high as in the United States and the standard of living correspondingly lower.

There is a small movement of skilled labor from France, valuable to our industries because the silk weavers, desigrers, dyers, machinists,

and other skilled workmen represent a certain artistic development, of which, in my judgment, American industry stands in especial need.

The supervision of French emigration is slight, but the French supervisor asks intending emigrants questions regarding their means of subsistence if they get no work abroad, and attempts to dissuade such as are likely to fall into want from emigrating. French emigrant agents are under strict supervision, and their occupation is gone as soon as they are convicted of making false representation or of fraud on the emigrant.

The French Government enforces strict regulations for the protection of emigrants on ship and one article of the French law prohibits the admission of any emigrant into France unless he has goods or money worth $40 for each adult and $16 for each child.

Since in one, or at most, two days, the past year more emigrants have sailed from Italy for the United States than from France in the whole year, French emigration is only of casual interest. The French who are coming to us, tend largely to go South where French is spoken, although many remain in New York. A considerable increase in the emigration of the French skilled worker would occur but for the bar of poverty and of language. The French are intensely patriotic, which is another dissuasive from emigration, and this dissuasive is punctuated by native deficiencies in linguistic talent. The Germans are natural linguists and absorb English with great ease, but the French find English pronunciation and orthography an almost insuperable barrier to ready amalgamation with our race. But as already indicated, an increase in the emigration of the French manufacturing classes could not fail to raise the æsthetic standard of our textile production which, it would seem, should be our present industrial ambition in an age when half of the value of the product lies in its beauty.

BELGIAN EMIGRATION.

Belgium, according to area, is the most densely populated country in Europe. The language is a bar to emigration, as it is in France, and other conditions which diminish French emigration also operate in Belgium. The fine subdivision of land in Belgium explains the density and general content of a population which otherwise would be excessive. There is as much immigration as there is emigration. Wages in Belgium are very low. In the agricultural districts men average 40 cents and women 25 cents per day. The demand of the best young men for the army probably is one of the causes of the extensive exploitation of female labor in the fields of Europe in general. The style of living of Belgian wage-workers is greatly inferior to that of workers in the United States. Much smaller farms obtain in Belgium than in any state in the world, but the misfortune is that three-fifths of the land is occupied by tenants.

Of 518,000 acres, 143,000 are in forest, 188,000 occupied by owners, and 283,000 by tenants. Over 40,000 acres of land are owned by the state and the communes. The annual rent of land per acre in Belgium is four to five times the average purchase price of new lands in the new countries of the United States. Of course, agriculture in Belgium is very primitive, and its profits are diminished by the distance, often considerable, between the cottage of the tenant and the land or separate plats of land which he cultivates. There are more workers of all classes in Belgium receiving 40 cents a day and less than in excess of that figure, while almost none receive 80 cents and upwards. Intemperance is more prevalent in Belgium than in France, and discontent among wage-workers is frequently quite radical and turbulent.

Formerly there was small emigration through Belgium to the United States, but since the improved service offered by the Red Star Line quite a large movement of emigrants from other states than Belgium has set in, without, however, any emphatic increase in Belgian emigration itself. Only about 12 per cent. of the emigration from Antwerp at present is Belgian, and as a rule these are not agricultural workers so exclusively as the emigrants from other European states. Some glass workers and experts in iron and steel manufacture, miners and others, are now emigrating from Belgium to the United States. A large proportion of the Belgian emigrants flow into Pennsylvania; some go to New Orleans.

There has been a considerable decline in the South American movement from Antwerp, coördinate with a similar falling off in the general European departures for the countries of South America. Below is a table which is self-explanatory.

Emigration from Antwerp by direct steamers.

To—	1889.	1888.	1887.	1886.
New York	22,050	24,849	25,350	17,089
Philadelphia	3,860	3,861	4,770	1,385
South America	11,434	6,018	1,017	1,131
Australia	1,735	838	2,257	1,949
New Orleans	211	514	350	491
Boston	1	8	12	....
Montreal	....	....	18	4
Cape Town	7	....	....	....
China	....	10	19	....
	39,298	36,098	37,793	22,040

In 1890 the emigration through Belgium does not promise to vary much from that of 1889, but its direction has undergone some change, due to the decline in the South American current. For six years beginning with 1880, when the emigration through Antwerp first became noteworthy, about 150,000 emigrants sailed from that port for New York, of whom less than 10 per cent. were Belgians; 18,079 sailed for Philadelphia, and 872 for Boston, and 2,300 for New Orleans. The foreign population of New Orleans is increasing to no small extent from the Latin and Gallic races of Europe. There is also a small movement into Texas from these same races, the object of the French contingent being the culture of the vine. The present indications are that the development of agricultural enterprise in the southwest, and to a certain extent in the South, is to be secured through an increased movement of emigrants from southern Europe, where climatic conditions closely resemble those amid which they were reared.

Of the departures from Antwerp 33 per cent. and upwards average to be Germans. The Swiss average nearly as many as the Belgians, and it is a curiosity of the statistics that more English than Belgians sail to the United States from this chief Belgian port, an illustration of the fact that competition makes the longest way round the shortest way away from home. In the emigrant list from Antwerp this competitive tendency brings through that port Austro-Hungarians, French, Italian, Luxemburgian, Dutch, and even Russian emigrants, the latter in small numbers. About 33 per cent. of the emigration through and from Antwerp is female.

Representatives of the emigrant interest in Antwerp are responsible for the following statements:

No dangerous class of emigrants, such as criminals, paupers, etc., go from Antwerp, so far as is known. The majority of the emigrants are rustics. The steamship com-

panies employ no unusual means to win emigrants. Every precaution is taken to avoid danger from contagious or infectious diseases. The emigrant lodging-houses are carefully kept and fumigated, and a medical examination is made at each sailing. Last year there was a Belgian rush to South America, but this year there is only a small movement, as many have returned discouraged and dissatisfied.

The agent of the Red Star Line says:

The number of emigrants from Antwerp to the United States from January 1, 1890, to July 31, 1890, was 18,134, against 16,963 during the same period in 1889. [It is evident that the decrease in emigration to the South American States tends at Antwerp, as at Naples, considerably to swell the number moving on the United States.] Our emigrants come chiefly from Germany, Austria, Switzerland, and Belgium, with smaller numbers from Italy, France, and Russia. The peasant emigration is in large majority from all points. We have detected no paupers or criminals amongst our emigrants, and have never met with Mormons, who, if we are not mistaken, sail via England. No cases of leprosy or cholera have been found at the medical inspection, which takes place before sailing by the Belgian health officers. There exist no summer and winter rates for steerage as for cabin passengers.

The steerage rates are subject to changes and are regulated by competition. Formerly there were frequent war rates but for some time the rates have been steady for 90 marks to New York and 80 marks for the smaller ships going to Philadelphia from Antwerp. The number of prepaids depends to a great extent on how the rates in America compare with the rates on this side, as agents and passengers avail themselves of a difference which may exist between these rates respectively. From 10 to 20 per cent. is the usual proportion of prepaids; but there is a margin of uncertainty beyond this in the large number of prepaids which escape the control and knowledge of the steamship lines; we mean the prepaids which are not drawn on the lines, but on agents on this side. Taking these into account the proportion of prepaids may be much higher, but it can not even be guessed.

We have found no assisted or contract emigrants the past year. There were 4,023 steerage passengers returning from the United States, last year, to Antwerp, to visit their various homes. We have a contingent of steerage passengers who are going and coming continually. We have such passengers who have crossed and recrossed six times. There is no Scandinavian emigration through our line.

One of the emigration agents at Antwerp makes the following statements:

Quite a number of Belgian farmers are going to the Far West of the United States this year. They average to take with them 200 to 300 francs. Some have gone to Indiana, some to Missouri, some to Dakota, some to California, and a few to British Columbia. There is some emigration hence to Hull and thence by rail to Liverpool, perhaps 750 persons a year, going this roundabout way to the United States.

The French Commercial Line, starting from Antwerp and calling at Bordeaux for New Orleans, takes out about 600 farmers this year to the southern part of the United States. Many of these are rejoining relatives who have settled in Texas. These people have but 10 or 12 francs, on an average, after paying their passage, being generally "prepaid." Nine out of ten of these southern immigrants are too poor to have gone to the States but for a prepaid passage. If the emigrant takes a letter from America out of his pocket, it is safe to pronounce him a good man.

A look at the steamship ticket books shows farmers, engineers, carpenters, masons, furniture makers, machinists, printers, and dressmakers in this year's emigration—farmers predominating. From 70 to 90 per cent. of the emigration is from the farm.

Emigration from Belgium is unrestricted; no passports are required as in Italy. In winter there is quite a rush of intending emigrants to Antwerp.

Here is a glance at the steerage list of the various ships from Antwerp this year:

Via *Westernland*, March 22, 873: 300 Germans; 40 English; 105 Austrians; 27 Americans; 125 Luxemburgers; 32 Italians; 50 Russians.

Via *Waesland*, March 29: 20 Belgians; 125 Germans; 30 English; 85 Austrians; 19 Italians; 20 Swiss.

By ships sailing from Antwerp March 14 there was about the same proportion of races. In April the numbers were larger, particularly of Germans. On the ship that sailed April 4, twelve nationalities were represented in the steerage.

From Milan, in Italy, to Antwerp, Italians, and other steerage passengers are forwarded by rail for $12, luggage included, and when Antwerp lines are short of passengers rates are sometimes cut to $10 to New York, but the usual price is $21.50.

On April 25 the *Westernland* took from Antwerp 952 steerage passengers, of whom nearly half were Germans, and 112 Austrians and 64 Russians, besides Swiss, Dutch, English, and Italians.

The agent of a line carrying from Antwerp to South America says:

In 1889 we sent 1,500 steerage passengers to South America by one ship, now we are sending none.

By one ship forty-four Belgians have just sailed for Montreal. Our Russian emigrants come from Odessa and are mostly Jews, a very poor, ignorant, and pitiable lot.

The best emigration flowing through Antwerp is German, and it is about 80 per cent. of the whole. The German authorities try to discourage this movement, and here is a copy of a New York German paper, circulated very largely in Germany, which sharply criticises the course of the United States Government and of the authorities in New York on emigration. But these efforts of the German authorities to retard emigration do not seem to be very effective. The Germans returning from America to visit Germany and the letters of those who do not return are irresistible arguments for emigration. Those who return tell their German friends, "There is no chance for a poor man in the Old World. We've got the best land and the best institutions under the sun in the New World."

It is probable that the measure of the anxiety of foreign governments to reduce emigration to the United States is a measure of its value. The slums of Europe are not to any extent moving on the United States. The slums are stagnant social factors; as a rule they do not flow unless artificially moved, and, so far as I am able to discover, the artificial movement is now confined to the Jewish emigration from Russia and an occasional estray aided by British benevolent effort.

DUTCH EMIGRATION.

Dutch emigration is small, but as a rule desirable. The Dutch are excellent farmers, successful as dairy and stock farmers especially. The Dutch who emigrate are not all mere farm laborers, but many of them are well to do. Quite a colony of Dutch farmers have settled the past year in California, where they have corporate proprietorship of a large tract of irrigated land in Mercer County, which is sold to settlers at $175 per acre. Some of these settlers are said to be worth $25,000, and most of them have considerable means ranging from $1,000 upwards. From 100 to 150 persons have already sailed from Holland, and more are expected to follow.

These emigrants have houses, furniture, barns, agricultural implements, pianos, pictures, books, silverware, and other evidences of the Dutch capacity to get on in the New World, all of which are either owned already or being paid for on the installment plan. They will raise alfalfa, grapes, and other fruits, besides having stock raising and dairy products in view. Teachers for the colony's agricultural needs are employed, and thus new "Rotterdam" of California is without doubt to revive the Knickerbocker prosperity of our Atlantic coast on our Pacific shores. And here it may be remarked that, owing to various causes, perhaps among others to the increasing impression in Europe that the United States desire no emigration that can not help itself, there is an increasing number of well-to-do people joining the movement to the United States.

The movement of European capitalists on American industry as purchasers is one of the most noteworthy and oft-mentioned phenomena of the past year in finance as in population.

Formerly about 3,000 Dutchmen came to the United States per year, but the number within a few years has been fewer, while the emigration other than Dutch through Dutch ports has fallen off decidedly, due in part perhaps to the improved facilities offered by the Belgian and German lines. There is great competition in the various seaports of Europe for rivulets from the stream of emigration. Formerly about 25,000 emigrants a year averaged to pass to the United States from Dutch ports (from 1880 to 1883, inclusive), but the number now averages much less, and of this about 12 per cent. is Dutch, the balance representing other European nations in a ratio not greatly unlike that of the Belgian movement.

From 1880 to 1883, inclusive, the movement of all nationalities from Rotterdam averaged to be about 15,000 annually, of whom about 3,000

were Dutch, but there has been a marked decline since 1883. In 1889 the whole number of emigrants from Amsterdam to the United States was 5,058, of whom 2,490 professed to have skilled occupations. In 1890 the Dutch (direct and indirect) emigration probably will not exceed, if it equal, that of 1889. More Germans than Dutch continue to pass to the United States from Holland, showing that the Dutch have not only taken Holland, but mean to hold it.

Following is a list of emigrants from Amsterdam to the United States prior to 1889, which was given above:

Year.	Total number.	Number with occupation.
1884	4,612	2,204
1885	2,842	1,674
1886	4,647	2,428
1887	8,057	4,183
1888	8,117	4,546

How slight causes operate to promote or to retard emigration has already been indicated. A strike in the United States diminishes the outward movement. A strike in European countries, a menace of war, social unrest, clan persecution, increase the outward movement. It is surprising how soon industrial depression in the United States cuts down the European movement; and how soon European populations hear of good times in the United States. The tens of thousands of letters which come from our country into European homes are a more powerful factor in emigration than is generally supposed.

GERMAN EMIGRATION.

There is no doubt that the abnormal movement of German population to the United States, which the exactions of the military service of Germany generated, was heightened by the blood-and-iron policy of Prince Bismarck, and that the decline in German emigration, which for the first five months of 1890 was 6,000, as compared with the corresponding months of 1889, is due more to the progressive, industrial, and peaceful political policy of the present German Emperor than to any other single cause. There is an absolute scarcity of agricultural workers in Germany, a scarcity so noticeable as to greatly alarm many sagacious German economists. In the harvest and planting seasons the women are now doing a large part of the work; the women raise a large part of the beet-root crops on which Germany relies for sugar, while help at the busy seasons is imported from the neighboring frontiers on the north.

I have myself seen twenty-five women engaged on one large beet-root field, some of these even imported from the Scandinavian nations. The army and emigration have made alarming levies on the rural population of Germany. The Government, during the present year, has established a newspaper whose motive is the diminution of emigration and the exploitation of the colonies. From this paper I shall make certain significant extracts later on. This journal is published by the German Imperial Foreign office.

We have received in the United States about 4,600,000 German immigrants during the past seventy years—a large proportion of that number during the last twenty-five years—and it is conceded that the Germans are easily and advantageously fused with the native stock. In politics they are less clannish than most other immigrant races; in industry they are thrifty, and in character they average well.

The study of the German emigrant may profitably be pursued in the German country, and at the chief points of embarkation, the ports of Bremen and Hamburg. No one who has lived awhile in the German countryside but feels anew the conviction that in patient and painstaking industry, thrift, and the serious character which is antirevolutionary and truly civic, the Germans are the most admirable people on the continent of Europe. The socialist movement in Germany is a rationalist movement in politics. There is no large revolutionary or anarchistic sentiment in Germany. The Germans expound the most daring theories but leave others to exploit them. They respect au-

thority, love institutions, and take a good slice of a century to hunt up a constitution for a constitutional government after they have decided to have one. The German influence in the United States, on the whole, is, and will continue to be, conservative.

A glance at the movement of emigrants through Bremen in the summer of 1890 is not without interest. A visit to several emigrant lodging houses and to the booking offices the day before the sailings reveals some hundreds of men, women, and children, with packs on their backs, the women especially being burdened with bundles often more bulky than themselves. Many of them wear wooden shoes. There is a great preponderance of brawn in both sexes, but the women give evidence of out-of-door exposure; the beauty and grace which one may see even in peasant women of the Latin race are wanting. There is less vivacity, but more endurance. These people are better content in poverty than our native American population is in comparative affluence. This portrait has its pathetic as well as its practical side. The genius for repose, which is quite wanting in American life, may be too pronounced in these German and Scandinavian contingents; but some infusion of contentment will not harm us.

There are parties of Austro-Hungarians in these groups of intending emigrants to the United States, more demonstrative and less desirable than the Germans. Their presence here illustrates the fascination which things forbidden possess. For two years Austria has taken very stringent measures to prevent emigration, but without effect. Having punished the police and gendarmes who were in collusion with emigrant agents in running population across the frontier, the Austrian Government may have fancied that her young men could be fenced in, but every week in the emigrant passenger lists of neighboring seaports there is a considerable sprinkling of uneasy and not especially desirable Austro-Hungarians, many of whom flock into the iron and coal districts of the United States. Legislation and decree against the freedom of personal movement in this age of itching palms develop device and mother wit; as in Italy so in Austria-Hungary.

Men walk 100 miles by devious and obscure routes and byways to escape the Austrian gendarmes and to find some road that leads to the United States. All roads no longer lead to Rome, but all highways and seaways lead to America. One of these Austrians remarks: "A friend of mine, an Austrian, went to Wisconsin a few years ago and prospered. He sent for his wife. The Austrian authorities forbade her departure; but she is here." Legislation against nature falls flat. To stop emigration or to reduce emigration European nations must remove the causes which are behind emigration—land monopoly, landlordism, and militantism.

The extent to which "prepaids" are pouring into Germany, Hungary, Poland, and Russia is unprecedented. The 10 per cent. of the Old World which has crossed to the New World in the last half century, im-

pelled by comradeship and pity, now seems bent on importing all their relatives, friends, and neighbors, and so entire villages and rural neighborhoods from the Old World are being translated to the New World, where they are reproduced in similar classes and groups, into which sometimes the English language filters very slowly. The enormous sums of money which the United States is sending annually to Europe by "prepaids" are the basis of the prosperity of great fleets of foreign steamships, not to speak of the strong financial currents created thereby in such cities as Bremen, Hamburg, Antwerp, Liverpool, Glasgow, and Cork.

It is not too much to say that if the countries of Europe were for one year deprived of the vast sums of money sent to Europe from the United States by immigrants and taken to Europe by the visiting and returning immigrant, every department of European enterprise would feel the shock. It would feel it more keenly if to this were added every one of the hundred thousand Americans who annually cross the Atlantic as sight-seers. It is probable that in the past two years from these two sources upwards of $500,000,000 have been taken from the New World to the Old.

When we are computing the balance of trade, this enormous purse should not be left out of the account. On the contrary the productive value to the United States of the three-quarters of a million largely of workers who in the same period have come to our shores, should not be overlooked, which according to some statisticians, would be in excess of $500,000,000. Our minister to Sweden estimates an able-bodied Swede to be worth $1,000 a year to us.

An agent prominently concerned with emigration from Bremen estimates that 33 per cent. of the emigrants of 1890 are induced to go to the United States by remittances from friends who have previously come to our country. The same gentleman says:

> Many millions of marks are annually sent into Germany, Austria, Hungary, and Poland from America. This money goes to support the old folks, as well as to forward new folks. These (to Europeans) prodigal remittances serve to intensify the preëxisting impression that the new Canaan flows with more milk and honey than the old Canaan. When a letter comes into a German village bearing one or two hundred marks to some old frau the event is celebrated over the village beer and pipe, and in the halo the New World is transfigured—the more when the girl working in the field and the man working in the shop compare their wages in marks with those American wages in dollars.

The manner in which whole villages of Europe are thus depopulated is shown by the movement through Bremen and Hamburg, the chief arteries of Russian emigration to the United States. The German colony of Rohrback near Odessa has been quite depopulated within two years, one thousand families from that district alone having gone from thence to Maryland and New Jersey. Recently one hundred families more have gone via Baltimore. These people are mainly Jews and many of them have been assisted by friends. The groups of Jewish em-

igrants from Russia form the saddest picture which the observer of emigration is called on to contemplate. Their faces are pathetic with the silent story of persecution, poverty, and hunger which the exodus of forty centuries ago could not well have exaggerated. Many of them are barefooted. I have seen them streaming through Stettin, coming from the dreary decks of lumber ships just arrived from Russia by which for a few pennies they are enabled to escape from Russia. Hebrew benevolent societies gather them in and by hook or by crook they find the free air of America.

I saw groups of these people at German ports just making ready for the States, young mothers with a nest-full of babies who were half nude, while the mother herself had very little clothes. To see these pitiful groups waiting for the salvation of the Lord in the promised land, turning the dog-eared leaves of the Hebrew Bible with undying faith in an ultimate Canaan, is to wonder on the one hand how much longer human brotherhood is to be a dream. Our country has always been justly proud that it is an asylum for the oppressed, the theater of unlimited catholicity and toleration; but our capacity to assimilate all those whom Europe has pinched, dwarfed, and persecuted, it is undeniable, is being severely taxed, though Americans would regretfully see the time when the law of self-preservation should even temporarily suspend the law of human brotherhood and silence the benedictions of universal asylum.

Regarding the emigration of anarchists and criminals through German ports, a representative of the German emigrant business says:

It is not believed that anarchists are going to the United States in such numbers as they did a few years ago. Two causes operate to diminish this movement—the retirement of Bismarck, which removes one of the leading stimulants to revolutionary as distinguished from evolutionary socialism, and, secondly, the heroic treatment which the Chicago anarchists received. Many socialists are among those emigrating, but these, as a rule, are peaceable disciples of Carl Marx or Lasalle.

The passenger agent of the North German Lloyds says:

Most of our emigrants have money left over after the purchase. Many have $100 to $200 each surplus. The North German Lloyd Company in 1889 forwarded 160,662 passengers to foreign countries. Of these, 48,972 were Germans, 27,760 were Austrians (or 10,419 Austrians and 17,341 Hungarians), 11,438 were Russians, 3,672 were Scandinavian; 722 were from other European countries. Of these 163,685 (including cabin passengers) were forwarded to the United States and 47,022 were dispatched to South America.

The emigrants to South America were recruited for the larger part from Spain, the rest from the Netherlands, Germany, Russia, and Scandinavia. Up to July 1, in 1890, this company has forwarded to the United States 56,987 passengers, 5,901 in excess of the corresponding period of 1889. To South America the emigration up to July 1 of this year has been rather slow for several reasons, but I expect it will soon commence again on a larger scale. This South American emigration depends on advances and encouragements which the South American countries may give emigrants, and on the degree of prosperity which last year's emigrants report. Very few of our emigrants are from cities, but they are mainly farmers or peasants. Our German emigration in 1889 was distributed from eighteen states prominently, and from

other small states in a degree, and Bavaria sent us the largest number, 6,163; next came Posen, with 5,946; West Prussia sent 5,688; Hanover, 5,561; Pomerania, 4,618; Würtemburg, 3,271; Nassau, 2,149; Brandenburg, 2,025; Hessia, 1,328; Baden, 1,248; Westphalia, 1,206; Saxony (Kingdom), 1,194; Oldenburg, 1,107; Schleswig, 1,039; East Prussia, 1,079.

The past year no criminals or paupers have been detected in our steerage list; nor do we believe we have forwarded any Mormons to the United States. We have never found a case of leprosy. We had one case of small-pox in 1889, and have occasional cases of scarlet fever, measles, and diphtheria. Whenever an emigrant is sick or is looking suspicious, the boarding-house keepers, who are under our control, are obliged to report at once, and we send the physician to examine whether or not it is a case of contagious disease. If it prove to be such the patient is brought to the city hospital, where he or she must stay at our expense until the danger is passed.

On the morning of the departure of the steamer all the emigrants, before being allowed to enter the depot to pass to the ship, must be inspected by the ship's doctor, one by one, and all suspicious cases are strictly shut out. I do not know what nationalities tend to increase and what to decrease in the steerage list; there is a good deal of variation from month to month. I think that our emigrants average to take out $50 surplus, but that is simply an estimate.

For four years there has been almost no variation in steerage rates, which are governed by competition only. The lowest rate for the present year now in operation is $16, but this rate refers only to emigrants from Scandinavian countries, via Bremen to New York, due to competition of British lines, which has kept the rates very low. My impression is that 90 per cent. of the emigration via Bremen to the United States, and perhaps even more, is caused by letters from friends in the United States, while the proportion of prepaid tickets this year rises to 30 or 40 per cent. of the whole. I know of a few cases of children going over to join their parents, and wives to join their husbands, whose passage was paid by assistance from this side, but I know of no organization for any such special purpose. We are not aware of the forwarding of any contract labor or of any attempt to do so.

Last year 20,102 steerage passengers came over to Germany from the United States by our ships. Most of these return to the United States within a year. Of course these are better off than most of the other emigrants. Those who come back to Germany with the purpose of staying, as a rule, have not much more money than just to reach their former home.

The total emigration from Russia via German ports in 1889 was 36,629, of whom 11,438 sailed via Bremen, 24,875 via Hamburg, and 316 via Stettin. The Russian emigrants via Bremen were to a great extent German farmers who formerly had emigrated to south Russia and who generally are well-to-do people, or Polish and Lithuanian farm laborers, in smaller part Russian and Polish Jews. These Jews are the poorest class of emigrants in every respect. It is for the reason that they can hardly pay their fare that the greatest number of them go by routes cheaper than the Bremen route. Most of the Scandinavian emigrants go via England, but the few thousands who come by the way of Bremen are people of good appearance, but sometimes apt to take to drink, and generally without money after paying their fare.

The American consul at Bremen states:

The emigration to the United States from Bremen in recent years has been as follows:

1884	102,429	1887	96,944
1885	83,072	1888	92,777
1886	74,232	1889	97,873

showing considerable regularity. Perhaps 10 per cent. of this emigration comes from cities, and of this at least 5 per cent. is very undesirable. German emigrants,

as a rule, are desirable, industrious, and will make good citizens. I do not think that educated socialists are going to the United States in large numbers. Perhaps German emigrants take $50 to $100 with them to the United States. The greatest encouragement to emigration is that offered by prepaid tickets, which, I think, are about 50 per cent. of the whole. The Mormons are doing no work in Germany, as the police forbid them, but in Sweden and Denmark I think they are operating.

I think there is some danger of contagious disease getting to the United States from this part of Europe, especially from the lower strata of Eastern natives, that gather in German ports to sail for America. A more thorough health inspection in my judgment is called for. From the transient crowd of emigrants from all over the world that congregate here on the days of sailing, I judge the Bohemians, Hungarians, Poles, Italians, and poor Russian Jews are not so desirable. Few Germans will become a public charge, because few sail who have not work prepared for them or friends who will assist them in the United States. Many young men from all classes and conditions in life emigrate hence to escape military service. To better their condition in life is the chief motive, however, of all emigration. The prepaid contingent leave Bremen with tickets to their ultimate destination by rail from New York; they know how to get there and just what to do on reaching New York; but only a small number of new emigrants can understand or speak English.

The German Government is doing all it possibly can to stay emigration to the United States. If it could, it would prohibit it altogether; but the results, as shown by statistics, are quite impotent. No German newspaper can receive or accept advertisements of a nature to induce or encourage emigration, and no posters or circulars of any kind whatsoever in relation to emigration are permitted by the authorities in public places. There is even an attempt to suppress the circulation of such matter through the German mails. The Government refuses to grant licenses to emigrant agents to do business, sell tickets, etc., and soliciting emigration is strictly prohibited.

The following is a statement of the purely steerage emigration from Germany in recent years:

German emigration via—	
Bremen	48,972
Hamburg	22,963
Other German ports	2,166
French and Dutch ports	16,231
Total	90,332

Against the following from 1881 to 1888:

1888	103,951	1884	149,065
1887	104,787	1883	173,616
1886	83,225	1882	203,585
1885	110,119	1881	220,902

In 1889 have emigrated to the United States, 84,497, against 99,800, 1888. To Brazil, 2,412; to Africa, 422; to Asia, 262, and Australia, 496.

One of the most striking facts about the present movements of population is the vast development of internationalism of a practical kind, the large numbers, especially of Germans and Italians, who gravitate between the Old World and the New, finally having done their social and economic evangelism, settling down as well-established Americans. The education in politics which is thus spread throughout Europe is great. Historians are fond of dwelling on the momentous consequences of the Crusades, but they have not yet the "data to weigh the far-reaching influence of the economic crusade generated in the nineteenth cen-

tury by cheap transit, steam, quick mails, the bill of exchange, and the newspaper. The amazing progress of democracy in Europe is as much the result of emigration to the United States as it is its cause, and no political foresight or economic insight is at all adequate to intelligently predict the changes in political, economic and social life which the electric disciplines of population are liable to generate in the twentieth century, in whose dawn most of our contemporaries, both in politics and in industry, are soon to be living. When one line of steamships from a single port in one year delivers from Europe to other continents people in numbers ample to create a large city, or half as many people as now dwell in San Francisco, we begin to perceive that amazing as were the consequences of the Aryan movement on foot, in the dawn of history, the European movement by steam in the nineteenth century is a colossus in comparison. What should we say if in a single year over 50,000 Americans should sail from Boston to find a home in Cape Town or New Sydney?

That it begins to be a question for statesmen as well as for philosophers, for political economy as well as for builders of the census, for legislative halls as well as for steamship exchequers is not surprising.

And now a more particular glance at types is of practical interest. A new type is pointed out in a group of emigrants at Bremen—lieutenants, depleted barons and counts, officers who have fought duels and found other homes more desirable, bankrupts, even bankers who have collapsed in the remarkable fluctuations which Germany has witnessed in her recent financial history.

Representatives of these classes are constantly going to the United States in quest of repair for dislocated fortunes—these generally go first or second cabin. The number of actual emigrants who do not appear in the records of Castle Garden is large and tends to grow larger. One modest second-cabin passenger remarked: "All the best people now go second cabin." The second cabin doubtless is becoming a more important factor of emigration every year. Germany has the largest unavailable surplus of thoroughly educated men of any country in the world, and only the United States surpasses Germany in the number of those who might be said to be "passably well" educated. The German emigration is as literate as the emigration of Italy is illiterate.

I observed in the second-cabin list of a ship sailing for the United States from Bremen, an impoverished count who spoke several languages; was a graduate of the university of Leipsic. The paternal estate was not ample to keep up the social dignity of a number of sons and daughters, and social conditions are such in Germany that an aristocracy without land or money finds a more congenial clime in the United States. The efforts of Germany to purchase dismembered estates and create a small farming class are in the right direction, but time will be required to make the results tell in the successful colonization of the provinces, for emigration yet pours *out of the provinces* where these colonizing efforts are most pronounced.

One of the emigrant lodging-houses in Bremen furnishes the following types: Here are 200 emigrants who will sail on to-morrow (July, 1890); perhaps 50 of them are emigrating for the second time, having returned "home" to Europe to break the last links and settle their affairs, take their families, and finally cast in their lots with Americans. It is evident that we count not a few European emigrants at Castle Garden twice and a considerable number thrice. Says one of the observers of the emigrant movement to the writer:

There are 40 young fellows in that group yonder whom I saw returning from the United States last fall. They are now about returning together to the United States. I can not prove that they are contract laborers, but I believe they are. They form an illustration of a good many emigrants. They have a leader; if the boarding-house gets that leader, he gets the whole party—they follow him as the sheep follow their leader. These parties formerly went to Holland to make brick by contract; now they do better by going to the United States. Do you see that woman who goes along with them with that huge pack on her back? She does the drudgery for the workmen, cooks for them and carries their rags. Every group of ten of these contract workers has an old woman to do their cooking.

Who are they? They are generally Poles, generally young, generally ignorant. They are warranted work in the States at better wages than they used to get in Holland. They scrape together considerable money in the States and return to Poland each autumn to stay until they are again wanted in the ensuing spring in the United States. They travel from Poland to Bremen in fourth-class cars, like cattle and at live-stock rates. They can get rich on low wages, live on pork and stale bread, and are killing competitors of unskilled American labor.

Perhaps the most pitiable lot in the emigrant groups which I am describing is a party of Russian Jews starved out of Russia, going to the United States to join the congested ranks of middlemen. They are almost revolting, mainly pedlers of the smallest scale. Nobody wants them even in the poorest emigrant lodging houses. The more one observes this movement the more he is inclined to say that the place to stop it is not at Castle Garden but in Russia.

I learn that in England students of this subject are now urging that the question be made a subject of diplomatic attention, for England is suffering from pauper immigration more notably according to its population than ourselves.

A comparison of the personnel of the various natural groups in Bremen emigrant lodging houses shows at a glance the superiority of the Germans and Scandinavians. These Germans have an average of $50 in their pockets, besides their tickets to the American destination, some of them as far as Missouri and Dakota, but the Jews and Poles are practically penniless. Had not many of them friends in the United States failure to obtain work on landing would force them into our almshouses or into beggary.

And yet (says an agent) some of these ragged fellows have plenty of money. I have known one of the most abject of the lot to beg his fare to America; pretend that he had not money enough to within 10 marks to buy a ticket, who, being searched, was found to have lots of money. I asked one fellow, who solemnly swore he hadn't another kreutzer, to submit to examination. He did so reluctantly, when he finally

showed up quite a purse of florins. I said to him, "Why did you lie to me?" He coolly replied, "I didn't lie; I hadn't a single kreutzer."

"Formerly there was medical examination of emigrants by a physician in the service of our Government and under the control of the United States consul, but for economy's sake this examination was abandoned. I think that it would be well to re-establish such United States inspection on this side, not only for medical reasons, but because it would give the United States consuls in Europe some practical connection with the emigrant movement and many clues to what is going on that at present our representatives in Europe have no opportunity of securing. Formerly there were two medical inspections by the United States doctor, one at the depot in Bremen and one at the ship, besides the inspection of the ship's doctor. Formerly the United States inspection used to throw out from three to six intending emigrants for bad or threatening appearance of disease, giving the benefit of the doubts to the majority. Since the abandonment of United States inspection in Europe, quarantine has been more frequent.

The number of children going to the United States this year through Bremen and Hamburg is larger rather than smaller than usual. I observed one family of fifteen children and several of ten children. The Germans have boxes, trunks, and chests nailed up, full of effects, but the Poles and Bohemians (especially the suspected contract groups) have only what they wear. In a lot of twenty-four the only baggage I could discover was twenty-four pipes. If there is any baggage in the Bohemian ranks their *vivandiere* carries it. The young men never give the pack-bearer a lift, but the poor woman with bent back fetches up the rear, a striking object lesson of the degradation of her sex in eastern Europe.

One of the emigrant middlemen states:

The English Government has secret detectives here at Bremen, under an old understanding with Bismarck, looking out especially for anarchists. But it is European paupers whom they have need more to look out for, if they only knew it. It's absolutely dreadful the way these poor wretches are dumped into England by sailing vessels, steamers, and all sorts of ships. It's come to be an accepted idea on the Continent that if there's anybody who hates himself, anybody whom everybody wants to get rid of, quietly help him over to England. You get a lot of these fellows in America, but England has more of a grievance than the United States.

My observations in England lead me to believe that there is probably much truth in these statements, but I am also inclined to believe that much of this worthless emigration which floats into England uses England as a way-station to a yet further pilgrimage, which ends in New York, Philadelphia, Baltimore, or Boston.

About the offices in Bremen where emigrant tickets are sold are some interesting subjects. The Polish emigrants who are going over for the first time do not understand where they are going, except to America, whether North or South America. They do not know, because it is all "America," but the Germans have maps in their pockets and point out just the place of their several destinations.

In the spring of 1890 agents sent out to Austria and got Austrian high officials to help them drum up recruits in plain violation of Austrian law. A great increase in Austro-Hungarian emigration ensued, but the movement was discovered, the officials sent to prison, and the emigrants from Hungary and Austria now jump the fence in diminished but in yet considerable numbers. But 5,000 to 6,000 Austro-Hunga-

rians were induced to emigrate by Austrian officials receiving a commission of so much per head from Bremen and Hamburg middlemen. The influence of the almighty mark in inducing emigration is enormous. If there is the almighty dollar in America there is the almighty quarter dollar in Europe.

I have already referred to the obstructions placed in the way of emigration by the German Government. The German Lloyd's have great difficulty in getting an emigrant agent for the sale of tickets to replace one who dies. The government dislikes to license a successor, and one is secured only by giving heavy bonds. Germany wants to keep all who have money enough to emigrate. The frontier is well guarded, but refugees get past the line and pass into the States. One sees some pardoned criminals. A lawyer who was sentenced to imprisonment for swindling was pardoned and sailed hence for the United States to start anew. Such persons are advised to leave their country for the joint good of country and self.

An American resident in Bremen states:

I know of one case where two ex-convicts were assisted to leave Germany for the United States by a benevolent society. There are in every large German city societies to help ex-criminals to get a new start in the world. The United States consul at Bremen detected one case where two convicts had a new outfit and tickets for New York furnished by a benevolent society. These men were returned to Germany, but probably they have since gone to New York by some other line. They are birds of prey; you may see them in new suits and new outfits, hand-bag, etc., and generally they are tramps or ex-criminals who are being helped out of Europe, not by the government, but by so-called benevolent societies, whose object in part, I fear, is to get rid of undesirable population more than to bless all mankind.

If a medical inspection were reëstablished, the United States consul could get a chance to look at other aspects of emigration as well as at the sanitary side of it. To be sure, our consuls would have to make long days, at times, but they ought to have enlarged jurisdiction over emigration. The place to regulate the emigrant is before he is an emigrant—certainly not when he is an immigrant. A few examples at European docks would be very telling; for many objectionable persons are sent to the States by communities and cities as well as by societies.

I have known rates to the United States as low as $7.50 in times of sharp competition. In Würtemburg and other centers for emigrants you may often buy tickets for America cheaper than in Bremen.

The German emigrants generally leave here in clothing which they have made themselves, comfortable and clean. Before they leave their neighborhoods in the German country they weave their own cloth; the wandering tailor comes and cuts the garments in their houses; the boot maker comes and boots them for a year; so they take a year's stock with them—paying the tailor and the boot-maker each about 37 cents a day. The Germans are famous for keeping a lot of linen and wearing apparel in their trunks. The character of a German servant girl is measured by her stores of linen and stockings. If she has thirty pairs of stockings, she is a good girl, and for a year before she sails for America her knitting work and her loom are busy. Domestic weaving of linen in winter and in wet weather, when outdoor farm work is impracticable, prevents the possibility of any idleness in German domestic life.

The same authority, speaking of Jewish emigration, remarks:

I think the prejudice against the Jews is industrial and secular rather than religious. Their habitual disregard of codes of European morals creates antipathy. Each

race has its own standards, and an industrial population lays greater stress on integrity than does a purely agricultural or ecclesastical people. The Jews have their virtues; many Jews in Germany are our best citizens, public spirited and productive, but those who sell their birth-right for a mess of pottage are in no respect desirable.

Here are some types from the emigrant list of one of the North German Lloyd's ships as studied in a Bremen emigrant lodging-house. There are several Hungarians who have skedaddled from military service. From this company some were abstracted by the gendarmes on the Austrian border, but these escaped and tell rich stories of their adventures in evading the police. Of eight hundred steerage passengers on to-morrow's ship two hundred and fifty are Hungarians, one hundred are Norwegians, and the remainder Germans. You can tell the nations of eastern Europe by two senses. The cleanliness of the Germans qualifies them for distinction solely by the sense of sight.

One of the Hungarians says:

I go to Cleveland to work in copper works; my brother is there; he makes four times the wages he could in Hungary. I was a farm worker in Hungary. I shall send for my family as soon as I get money enough to pay their passage.

Another says:

I go to join my son who is in Pittsburgh where he makes $1.50 per day—four times the wages in Hungary.

A barefooted girl of perhaps twenty years, her head picturesquely draped in a bright kerchief, is going to join her father in Wisconsin.

One farmer's wife (Hungarian) with five children and a servant is going to join her husband in Cleveland, Ohio, where he is earning $3 a day. She is a cleanly Austrian housewife, speaks German, and has the physique of an Amazon.

A Hungarian girl, who has earned $7 a year in the family of a Hungarian nobleman, because she hears that in the United States she can earn in two weeks as much as she has got in Hungary in a whole year. She has with her another girl, her friend. She wears thick cowhide boots of tremendous kicking capacity, short skirts, a kerchief-covered head, and a profound faith in the New World characterizes her face, which is comely and nut brown. Yet another, another Hungarian girl will join her father in Minneapolis and do housework. Another, a man, is making his second pilgrimage to the States; has been a brick-maker in New Jersey at $2 per day, vice 40 cents per day in Hungary.

A young German farmer, smoking a pipe of enormous stem, will join his brother in Clinton, N. Y., and will stay, if he likes. Most of these cases are assisted by friends in the United States. They average to have about $10 in their pockets.

A German chair maker will join his brother in San Francisco and shows a ticket from Bremen to that city prepaid.

On the sidewalk is another group of Hungarians about to sail for America. Some of the adults are barefooted. One has rags on his feet and is vainly trying to get an old boot over the rags.

A jocky-looking fellow, with a rakish air, is probably an adventurer from a Hungarian city. He has an impudent and assertive presence, which is in striking contrast with that of the rustics about him.

But out of a hundred or more I find but few who have no trade or who are at sea respecting their destination. "Friends in America" is the inducement and the source of definite knowledge and purpose of a very large contingent of all emigration to the United States.

A visit to an emigrant lodging house which is the headquarters largely of Swedes, who are cared for at the expense of the ship until to-morrow's sailing, reveals an apparently very desirable class of emigrants. One, a carpenter, a bright fellow, is the only English-speaking man I have found out of several hundred of emigrants encountered at Bremen. He has been in the United States several years, and says: "I voted for Harison for President"—the first politics I have ever discovered in a European emigrant. His family is in New York and he has been over to Sweden on a short visit. He gets $3.50 day wages in New York, but 50 cents a day he used to get in Sweden. Another is a sailor, also a Swede, going to San Francisco, a fine-looking fellow. Another is a farmer, going to California. A fourth has a ticket for Wisconsin where he will work in a mill.

There is also a company of Finns, a hardy, big-bodied lot, going West on assisted passages or prepaids. One says in broken English:

> I'se no friend in de United States but de dollar and I find him *dere*.

One Finnish girl was frightened by the interpreter's questions, fearing lest they indicated she was to be sent back to her home, burst into tears, but was reassured on learning that the questions had no such significance, and kissed his hand in gratitude.

The scenes at the embarkation of steerage passengers in Bremen, Hamburg, and other foreign ports are both ludicrous and pathetic, according to the point of view of the observer. One cabin passenger (a German) looking at the motley and ragged crowd literally taking up their beds and walking in quest of new homes in the sunset land, remarked:

> Thirty years ago I set sail in an emigrant ship from Hamburg for New York. When I landed I was without a penny. Since then I have lived in the United States and have prospered.

I was informed by others that he is a millionaire.

> Notwithstanding the 30 per cent. protective duty on farm products, the German farmer is crippled by scarcity of workers [says a German farmer], and there is talk of importing coolies. We now get a few at harvest from the cities and some from Silesia. The great trouble is low wages. Germany is pressing colonists into Africa and importing Swedish women to help the German farmer.

Two hours from Bremen by rail is Hamburg, the most important and populous seaport in Germany, and of particular importance in these studies of emigration. As many as two thousand emigrants a week leave Hamburg for foreign ports during the spring months, and of classes more varied, if possible, than from Bremen; certainly a larger contingent of Russians and Hungarians and other peoples of the north and east of Europe. A movement of Roumanians has begun and efforts are being made to bring over a "bunch" of six hundred from one Roumanian district to settle in the United States. There is one important feature of the emigration from Hamburg—the Mennonite movement from Russia. These people are wealthy farmers of a high class of intelligence, and several hundreds have sailed for the United States the present year. They generally choose the express steamers of the Hamburg-American line, and avoid the steerage in many cases.

One party of two hundred of these people who sailed last spring (1890) had $50,000 on deposit in Hamburg, which they drew out before sailing for America. These people are very religious and moral, and come from the Odessa district in Russia. The low rates of interest and minimum rates of profit in old countries are very important factors in the increase of capital in new and prosperous countries like ours; but it would seem that the movement of emigration was never before so manifestly accompanied by a stream of gold. The sums which we spend in Europe on travel, pleasure, and education, are restored to us with compound interest by capital seeking investment and labor seeking a more adequate reward. The stream of emigration is now bringing to us all classes of Europeans, the rich, the titled, the upper middle class, the lower middle class, and the half-starved peasantry.

An American, long resident in Hamburg and a close observer of social and industrial life as well as of the movements of population, speaks as follows:

In some years nearly half of the immense emigration through this port has been women and children. Of the 23,000 who were classed in one year's emigration list as "without occupation," a very large majority were women and children.

The large proportion of emigrants usually, however, are able-bodied men, and we should reflect that we get them at the most productive period of their lives. It probably costs a thousand dollars in the United States to get a child into useful and educated manhood, and probably half as much in Europe, so that a country which is parting with its young and middle-aged men and women is losing a vast labor power, and the country which takes this power must necessarily increase in wealth and enterprise in a phenomenal degree. On the contrary, we are expending no small part of this gain in rearing and educating the children of emigrants whose families are more numerous than our own. The industrial development of the United States amazes Europe, but Europe has greatly contributed to this result under the leadership of the native American population.

Germans possess the old roving spirit of their Teutonic ancestors, and this spirit is punctuated by the dislike of the army service. All able-bodied youth between seventeen and twenty-five are subjects of military service, and can not emigrate unless they can produce testimony that they are not emigrating to escape military service. There are secret societies to promote emigration as well as charitable societies to help unfortunates.

It is a curious fact that overpopulation relates less to absolute density than to the opportunity of livelihood. The most densely populated parts of Europe send the fewest emigrants. This is true not only of cities but of countries like Belgium and sections of all countries. For example, Pomerania has large holdings of land and landlordism prevents small farming; the movement of emigration thence obviously should be large, as in fact it is. Throughout the world it is true that the average hardship of life in cities is less than in the country. After a time overpopulation in cities by its own distress will cure or tend to remedy this evil, and then we shall probably begin to see improvement in the condition and profit of agriculture. The conditions which promote emigration accordingly are social, political, and economic. In Bavaria small farms prevail, and there is less emigration from that state than from most other states of Germany.

A German-American in Hamburg speaks as follows:

Many criminals and socialists have gone to the United States from Germany in recent years, because they are not so thoroughly hounded there, while the American laws are less impertinent than the German. Our German Social Democrats have so much freedom in the United States that they don't know what to do with it. Religious toleration in Germany is boundless because, for one reason, religion sits very easily on the German conscience; hence, the religious bias, which formerly was a great factor in the transmigrations of population, has very little active force in the modern equation by which equilibrium is maintained in the matter of mouths and bread.

As to contagious diseases my idea is that we ought to prohibit the exportation of rags unaccompanied by a consular certificate of disinfection prior to shipment. Infection also is sporadic chiefly through old clothes tied up in infected districts and opened up on ship or on shore.

It is a fact, by the way, which may not be generally understood, that German anarchists as a rule are persons of one of three skilled trades—printers, tailors, and cigar makers. In fact the presumption is if you see a German printer, tailor, or cigar maker going to the United States that he is a pronounced socialist, often a decided anarchist. I have often noticed that the anarchists are men who belong to the *sitting-down trades.*

I presume it is not generally known, but I have reason to believe that the police of Hamburg have a standing contract with ships regularly leaving for English ports to ship German paupers, tramps, and other scum of German and European civilization to England. The great question of modern government is, "What shall we do with the criminal and pauper classes?" You see how Hamburg solves the riddle; but I often wonder at the patience which England displays over this business.

In fact, the doctrine of *laissez faire* is so ingrained in the English individual as well as social and political life that it is with the usual

extreme reluctance that English law touches even the right of a tramp or the freedom of action of a pauper.

The Hamburg police (continues the gentleman above quoted) don't give tramps and paupers from the interior or from other countries of eastern Europe, the slightest show in Hamburg. They don't give them twenty-four hours to leave town as some police judges do in the United States, but they lock them up on board ship bound for England and in a few hours they are breathing the smoke of London, the fog of Hull, or the Scotch mist of Leith or Glasgow. How many of them in course of time reach New York, Boston, Philadelphia, and Baltimore, no one can tell; but my opinion is that our laws, public sentiment, and the abject poverty of the classes concerned prevent any considerable emigration of this class and the British conscience and sense of international courtesy prevent any large deportation of paupers from England and Scotland into the United States; yet the impression is that our greatest danger of pauper emigration is not from Italy, Germany, or any other country of continental Europe so much as from the United Kingdom. Even the pauper emigration of Russia afflicts England more than the United States, as any one may see in the Jewish and other quarters of London, Manchester, and other large cities of England and Scotland both those on the seaboard and those in the interior.

Returning to Hamburg, let me call your attention to the fact that this city has more shipping in the foreign trade than is owned by all the United States, and in the past nine months I have never seen a ship bearing the American flag in this harbor. Even the coffee which you pour out of your coffeepots in the States passes through this port before it goes to you. The South American and East and West African trade of Hamburg is enormous and by subsidies it is being constantly increased.

The bonded warehouses of Hamburg are of enormous capacity. It is obvious that the United States, in attending to internal improvement have forgotten that the world's carrying trade is next in importance to its commerce and that the people who are swarming from Germany and Great Britain represent not only agriculture and manufactures, but the capacity also for commerce and the carriage of the products which create commerce. English is spoken everywhere in Hamburg; the children in the public schools are taught English.

There is enormous advantage in the race for trade, other things being equal, in favor of that race which can speak, read, and write in the two foremost languages employed by modern commerce. I see that in the United States you insist that English shall be the only language of the common school. In so far as you insist that your Germans shall learn English and be taught in English, in so far as you resist all efforts to denationalize English speech, you are correct; but a crusade against instruction in other languages is a mistake. I claim that if every man, woman, and child in the United States could speak and write three languages, or even two languages, our grip of the world's market would be irresistible and our utilization of the emigrant of much greater value to us.

As to the immediate emigration from Germany, let me call your attention to certain aspects of emigration from Schleswig Holstein. The movement from that province is more largely of young persons who are sent out to America before they arrive at the age of military duty. Many of these are young fellows who return to their native villages in a few years well dressed, more or less flippant and critical of German life. They boast of their successes and tell their old friends what big fools they are to stay in Schleswig Holstein and starve. The German authorities are watchful and recently they have sent these youths cavorting out of the country. These people apply to the consul with their passports for redress, but he generally tells them that their departure is naturally expedited by their own want of tact. American citizenship can't cure an ass.

In 1846 nearly all the emigration from Germany was moved to the United States in sailing vessels but in 1888 only eleven persons out of about

100,000 sailed from Hamburg under canvas. Of 88,000 emigrants from Hamburg in a single year only 1½ per cent. were from Hamburg; 21 per cent were from Russia, 29 per cent. from Germany, and 71 per cent. from other parts of Europe. Of the total classified emigration of Germany 65 per cent. of the males are unmarried, 33 per cent. of the females are single and there has been 65 per cent. more males than females.

Many efforts are made in Europe by agents of western railroads and of other owners of large tracts of land in the United States to induce emigration. The European steamship lines receive many requests from such sources to stimulate, invite, or direct emigration. The only way in which results are achieved in this direction is by putting a literature of the land in various languages into the steerage of steamers, and by putting special agents into countries where such work is permitted. But far less of this work is done than might be supposed. No doubt much might be done intelligently to inform, rather to advise, emigrants if a disinterested literature of American idle lands both in the West and in the East were distributed in the steerage of all emigrant steamships in various languages, for in the leisure of voyages of a week or ten days the large contingent of emigrants who read could be informed, while those who do not read would orally obtain valuable practical information. The Swedish settlement in Maine and the Scandinavian movement to Vermont are illustrations of how much can be done by informing emigration.

The steamship companies in Europe are very much afraid of the conservative reactions in the United States affecting emigration. Among many Germans there prevails the impression that "the States" are trying to reduce emigration, irrespective of its character, so far as the legislation of Congress is concerned, being blind to the fact that Americans are anxious to see the emigrant who can be turned into a good citizen and to suppress the pauper, convict, and undesirable classes only—those especially who can not safely be assimilated. Active prejudice against the foreigner is only sporadic in our country as a political or social fact. The Know-Nothing-party idea will always be a feeble and intermittent craze because most of us are foreigners or a few removes from foreigners. Reckoning as native Americans only those who are descendants of 1789, as our author does, we perceive that few of us are really orthodox Americans, according to the standard of some purists.

We are the country uniquely of welcome to the races, and because such is the fact, we have moved forward industrially, socially and politically. On the continent of Europe, on the contrary, the foreigner is the victim of an active and belittling prejudice. One who has undertaken a residence in a German city, will especially have occasion to observe the force of this prejudice, its annoyances and its costs. The law is against him and a gospel for him has not yet appeared. If he sends his children to a private school in Germany, if he becomes the

subject of taxation, he will soon perceive that the odds are against him because he is a foreigner. One who has himself been a foreigner in Europe will generally return to his native clime in America, more than ever attached to the breadth, height and length of the general American hospitality to emigrants.

Not long since a naturalized American, formerly a German citizen, came into the American consulate at Hamburg with a grievance. He had been in the United States for some years; had bought a farm in our country near a future city which grew out toward him and made him rich. He came to Hamburg and got the necessary permission of the city senate to buy a house in Hamburg; for a citizen of another country can not own real estate in Germany without official permission. Later on the man bought another house in Hamburg. His wife and children decided they did not want to return to the United States, and, accordingly, the man bought a third house in Hamburg, also by permission, for his own residence. The family thus settled down into German life and residence.

The man's passport having expired, he applied at the American consulate for another. The consul refused to issue another passport in his case, because he had so long been awayfrom the United States, and because he had for so long been practically a citizen of Germany, in his own German house. He then surrendered his citizenship in the United States and applied to the German Government to be reinstated as a German citizen; but the German Government after much delay, finally decided not to reinstate him, having in view, perhaps, the influence of such a precedent in encouraging an easy sense of the evolution and devolution of German citizenship. But a foreigner is not allowed to live in Germany on such a status.

The dilemma of this man was singular. He had sold his house in the United States; he had forsaken his citizenship in the Western World after abandoning his German birthright, and although he owned three houses in Hamburg, he was a man without a home, a man without a country. There are many similar cases, especially in Schleswig Holstein, formerly Danish.

Germany is very jealous of all influences which affect the national spirit, and emigrants who return and brag that they "Don't have to wear the Emperor's uniform," or who in other ways tend to sow seeds of disaffection or discontent, already plenty enough in the Empire, very speedily feel the heavy hand of "paternal government."

Among the many fiscal results of the German emigration movement to the United States is one not hitherto adverted to. As emigration becomes an historic fact with generations behind it, estates of Germans in the United States who at death left no heirs in our country, multiply. In the past summer $80,000 in hard money was sent over to Hamburg from one estate of a German, deceased, in the United States. Millions of dollars are annually coming to Germany in this manner; but perhaps

25 per cent. of as much returns to the United States from Germany through German estates divided among heirs, portions, or all of whom are our adopted citizens. As the ties between our country and Europe multiply, it is evident that the complexity of the question of emigration increases not only on its social and political but also on its economic sides.

Following are the replies of the director of the Hamburg-American steam-ship lines to certain inquiries propounded for the purposes of these studies:

1. The total emigration by our line in 1889 was 52,388 souls.

2. The total of emigrants forwarded by us to the United States of North America in 1889 was 47,160 souls.

3. We do not entertain a service to South America. The number of passengers forwarded by our Mexican West Indian line in 1889 was 3,708 souls.

4. We forwarded to the United States from January till June, 1890, 26,994 souls, against 20,143 souls in 1889.

5. The emigration during all past months in this year shows an increase in March and April of 33⅓ per cent; in May of 25 per cent.

6. The prospects for the rest of the year, let us assume for pretty certain, are that the number of passengers forwarded in the same period last year will be arrived at again.

7. The majority of our emigrants consists of country people. The emigration of laborers and from cities is not so great as generally is assumed, for even among those small artisans coming from the country there are many to whom farming is familiar.

8. As far as possible we estimate the number of real farmers at 40 to 45 per cent.; that of artisans and laborers at 25 to 30 per cent.; whilst the rest may consist of tradesmen, teachers, etc.

9. Our passengers come for the most part from North Germany. In Prussia, mainly the inhabitants of Schleswig-Holstein, Posen, Pommern, Brandenburg, etc., prefer the Hamburg port for embarkation.

10. We have had in some cases cause to refuse passengers applying to our agents for fear of their getting returned as paupers. In spite of our having repeatedly explained in the instructions for our agents and in special circulars the respective regulations of the American law, it is not to be avoided that now and then an inexperienced agent attempts to engage a person unable to gain his living. We have found out at the embarkation in the last two years in two or three cases such individuals, and caused their return home to their former place of residence. In most cases, however, the agents refuse the engagement of such persons because the whole responsibility is laid on them by us. The emigrants are examined here before their embarkation by a physician, and those who are suspected to be, through inner or external diseases, contagious or otherwise, or troublesome to their fellow-passengers, are excluded from embarkation by the authorities.

11. We forward from Havre, at which port some of our steamers call on their passage to New York, frequently, Italian emigrants, but in small numbers. The emigration from Austria, via Hamburg, has decreased considerably in the last year.

12. The amount after paying passage taken by the passengers with them to America varies very much, but as a rule it is certain that on an average the emigrants from the country most often take large sums with them. This is to be attributed to the circumstance that these people, as a rule, have sold their estate, cattle, land, etc., inherited or acquired by themselves, for cash to invest it in establishing a new home. We have forwarded numerous families in the course of the last year who took with them 10,000, 20,000, nay even 40,000 and 60,000 marks in cash. The average amount per head of the country people we estimated at 300 to 400 marks; artisans and laborers,

who can dispose only of savings gained by their own handiwork, and who do not require a larger capital for their establishing, take of course less with them, but even their money in cash may on arrival at New York amount on an average to 100 to 200 marks.

13. The steerage fares have been settled since several years by an agreement of all steamer lines from Europe to North America, and there does not exist any more a difference since about five years in the summer and winter rates.

14. The Mormons in the majority used to take their way via English ports per "Guion Line." As far as we know there is scarcely a larger emigration to be expected in the present year. They never went by our line.

15. About one-third of our passengers undertake the voyage on the ground of tickets bought in America respectively with money sent from there (so-called prepaid certificates).

16. Cases of assisted emigration we rarely have had to deal with, and generally it was the question to make it possible for women with children to get to their husband or father residing in America, who, though mostly having a good existence, had hitherto no opportunity to save the whole fare required for the passage of his relations.

17. Up to now we have had no opportunty to find out contract laborers; we would have excluded them at once from exportation.

18. Passengers of the criminal class have, to our knowledge, not been forwarded hitherto by our line, and also the control exercised by English detectives here since several years have had no results as far as we know.

19. The number of so-called returns may amount to about 6 to 7 per cent.

20. The number of steerage passengers forwarded by our steamers from New York to Europe amounts to about 13,000 per annum, and these passengers are on an average pretty well provided with money. We think, however, that irrespective of the difference in the number of passengers, the passengers to America take generally more money with them than those returning bring in proportion with them. This may be accounted for by the fact that those passengers visiting Europe are for the most part laborers, artisans, farmers, etc., and take with them only the savings gained by their handiwork, whilst those farmers gone abroad with a larger capital have invested their money in farms which they acquired as their permanent property.

21. The importance of the Russian emigration is often most decidedly underrated. An important, and for the United States most valuable, element is the farmers coming from the German-Russian colonies, so-called colonists, for the greater part Mennonites, who are excellent cultivators, and almost without exception in possession of considerable capital. These people, who have done very much towards the cultivation of many Russian, otherwise barren, tracts of land, leave their native country only by constraint of political and social, for them unbearable, circumstances. The Russian Jews are regarded throughout as traders, which, however, is a wrong conception. On the contrary, they are mostly small artisans, who devote themselves to the retail business in America only for the reason because at first they are not familiar with the peculiarities of American work and do not feel themselves equal to satisfy the requirements there, and also because their language is difficult to be understood renders their existence difficult at first.

22. We participate in the Scandinavian emigration to a larger extent only in Denmark, from whence we forward about 3,000 to 4,000 per year, mostly male, passengers to North America. These people go mostly to relations or friends already resident in America, and belong almost exclusively to the class of farmers who are sober and clever in gaining their living, and are to be considered as a most valuable increase of the population.

Finally, we would not omit to repeatedly emphasize that we, for our part, call the attention, by publishing the respective American regulations in prospectus, circulars, instructions for our agents, tickets, etc., in short all printings considered proper for this purpose, explicitly to the regulations of the American law which prohibits the

immigration of cripples, criminals, etc., and our officials are bound to exercise at the despatch a strict control, also to assist the authorities in every way fully and entirely in their measures.

The American consul at Hamburg, in reply to inquiries, says:

1. The number of persons emigrating over Hamburg to the United States for the last five years has been the following:

Year.	Direct.	Indirect.
1885	51,459	14,154
1886	47,213	40,226
1887	42,[illegible]65	24,368
1888	52,575	32,153
1889	44,590	25,255

The season of 1890 having opened much earlier than usual on account of the favorable weather the steamship lines running from Hamburg to America expect a much greater number of emigrants to go over Hamburg than in the previous year, particularly as the Hamburg-American Packet Company has started a new line of twin screw steamers to the United States and built a number of other slower but very commodious and seaworthy vessels.

2. Your next question, "What is the ratio of rustic to urban emigrants?" is very difficult to answer. No records are kept here in regard to this matter, and the only means I have to arrive at something like an approximate information on this subject is to consult the records kept here as to the trades or occupations of the emigrants. Hamburg is, I believe, the only port that keeps such a record, but the figures apply to *all* emigrants leaving this city for foreign ports, and not only to those departing for the United States. The latest figures accessible are for 1888, and show the following aggregates:

Persons engaged in commerce	12,926
Persons engaged in agriculture	6,594
Factory workers	10,492
Laborers	29,273
Mechanics	819
Not stated	28,633

3. The greatest number of emigrants coming through this port on their way to the United States at present is from Russia. The Germans passing through here at present are mostly from the eastern provinces, Silesia furnishing our largest contingent. For the summer, however, a large number of emigrants from Schleswig-Holstein and Mecklenburg is expected.

4. The Russians going over now are a pretty good class of emigrants. They come, in a great measure, from the German, or rather Baltic, provinces of Russia, leaving their own country on account of the religious persecution they are subjected to by the orthodox Greek Church. The greatest part of them are Mennonites. The emigrants from Silesia, Schleswig-Holstein, and Mecklenburg are likewise for the greater part very good, but those hailing from the Polish provinces of Prussia, Russia and Austria, from Slavonia and Hungary, are of a less desirable character.

5. It is very hard to find what proportion of the emigrants going to the United States are socialists or anarchists, but from the very large number of people here, particularly those of limited means, who hold such tenets, I judge that a very large proportion of the emigrants going to the United States are socialists. Of the more highly educated socialists who are exiled or expelled from Germany, I believe the majority go to the United States.

6. In regard to pauper emigration I have not been able to find any authentic case

where an infirmary or poor-house or any German official from this district has sent paupers or criminals to the United States within the last years. I understand that the Hamburg police have a contract with the owners of some English steamers, who, for a consideration of 10 shillings sixpence, take all alien paupers found wandering in the streets of Hamburg to England, as this is cheaper and easier than to send them to America. I suppose they prefer to rid themselves of these people in this manner.

7. The amount of money taken over by the average emigrant is very limited. Over half of the steerage passengers that went to the United States in 1889, went on tickets prepaid for them by relatives in the United States. All that the steamship companies require of them is that they are not totally without means when they land in America I inclose one of the printed instructions given by the Hamburg A. P. Co. and the North German Lloyd to their agents, in which they state what they require before shipping emigrants.

8. The steamship companies endeavor, of course, to get as many passengers as possible, but outside of occasional reductions in the prices of passage, I do not believe that they try to stimulate emigration to any considerable extent. The German laws forbidding this are very stringent, and if it is done at all it is done in a very cautious and private manner. There are, however, a number of American railroad and land agents in Hamburg who attempt to stimulate emigration to their districts, although they have to operate very privately on account of the above-named reasons.

9. In regard to the introduction of leprosy, I do not believe that this disease is prevailing in any of the districts from which we get the emigrants coming through this port. As far as the danger from other contagious diseases is concerned, I do not think that there is much chance of any person who is himself sick getting into the United States, because all emigrants are subjected to three separate medical examinations. But I think that diseases are often brought into the United States by the baggage of emigrants from districts in which epidemics prevail, and believe that the only way to guard against this danger is to disinfect such baggage both on this side of the ocean and on the arrival of the baggage in the United States. At present no disinfection takes place, and this offers, in my opinion, an element of danger to the health of the people of the United States.

SCANDINAVIAN EMIGRATION.

Swedish immigration to the United States began upwards of two and a half centuries ago, so that it may be said that the Scandinavian was one element of the Teutonic stock which entered into the elemental structure of our population. The two hundred and fiftieth anniversary of Swedish immigration was celebrated on September 14, 1888, at Minneapolis, Minn., at which an oration was pronounced by Hon. W. W. Thomas, our present minister to Sweden. The first Swedish settlement was in Delaware. To Mr. Thomas is due the successful colonization of the most northeasterly section of the Maine wilderness, where a Swedish farming settlement was established a few years ago, now increasing in wealth and prosperity. Swedish immigration to the United States first became prominent in 1863. In eight years from 1880, 311,249 Swedes came to this country, a vast influx when we observe that the population of Sweden is but little more than that of the city of London.

The Swedes are most numerous in Minnesota, where 200,000 Swedes and their immediate descendants are now living. There is no immigrant who makes a better or more industrious citizen than the Swede. A nation which under Gustavus Adolphus redeemed Europe from imperial and ecclesiastical tyranny and which produced such a Washington as Gustavus Vasa to free his country, contains the intrinsic material which founded the American Republic. There is no disputing the value to our country of the light-haired, robust race which has given statesmen to States, a Linnæus to botany, a Berzelius to chemistry, a Swedenborg to religious aspiration, an Ericsson to invention, a Fredrika Bremer to fiction, a Jenny Lind and a Nillson to song. The Swedes readily acquire our language; our instincts of liberty are theirs; our northern climates do not repel them. The more Swedish immigration is mixed with our composite stock the more surely shall we grip those forces of political and physical life which first gave impulse to our national existence.

The Scandinavian nations also are contributing to the forecastle many of the sailors that are indispensable, if we are to create a foreign carrying trade, elements of our national career quite as indispensable to the potential navy as well as to the possible merchant-marine which everybody believes the United States should have, but which we all confess the nation is very slow in possessing. The Swedes, Norwegians, and

Danes a thousand years ago manned their viking ships which plowed their way out of the creeks and fjords of Scandinavia manned by the most daring and able sailors that ever walked the quarter-deck. Five centuries before Columbus sailed for the New World, these gallant Northmen crossed the Atlantic and found the western continent, but forgot to give the story to literature, although they made their marks on the rocks and left their sign-manual, since identified.

The descendants of these old sea-kings, more tame than they, now are important to a new people who face two oceans and have more miles of sea-coast and navigable lakes and rivers than any people under the sun.

The emigration from Sweden to the United States for several years averaged 40,000 to 50,000 annually, but is now slowly receding. It is mainly peasant emigration, or, as our minister to Sweden puts it, "very agricultural." Mr. Thomas has this to say of the present movement from Sweden:

The Swedish immigration to the United States is largely promoted by prepaid passages from relatives in our country, but I think Swedes going to America will average each to have $50 in their pockets. Gothenburg sends out three-fourths of the Swedish emigration, that is they sail via Gothenburg. Young men predominate. The stream mainly flows to the farm of the West and to the forests of the Northwest. They are good blood, worth $1,000 a head to us.

The founding of New Sweden in Maine, only July 23, 1870, makes an epoch in Swedish immigration to the United States. Before that it all flowed West. The farmers and woodsmen of the Maine colony have remained there. The mechanics drifted out of the farming settlement, first to other towns in Maine then to other cities in New England. They did well and wrote back to Sweden for their friends. The result is that not only has New Sweden, Maine, grown to be a model agricultural colony of over 1,000 souls, but a hundred other *nuclei* have been formed in New England. Thus a portion of Swedish immigration has been turned upon New England, and the northeast of the United States, whose climate is suited to the Swede, now receives a portion of the enriching stream which before 1870 flowed altogether westward. Providence, R. I., now has 2,000 Swedes; New Haven, Conn., has 1,500; Bridgeport, Conn., has 1,200; Worcester, Mass., has over 5,000; Boston, probably as many; Portland, 500, and Piscataquis County, in Maine, 300, with 1,000 in Aroostook County in the same State.

These statements illustrate in a striking manner the position that our duty in the United States at present is directing rather than suppressing immigration, diverting it when it tends to become clannish, spreading it where it tends to become thin, and studying climatic adaptabilities, to remember that there are older States yet thinly populated, comparatively poor because of idle rather than because of barren soil, and that we ought to have the new west, to be sure, but also the new south, the new north, and the new east.

Speaking of the diffusive industrial tendencies of the Swedes, Minister Thomas makes the following interesting statement:

Our Swedish immigrants, having accumulated money at their trades in cities, are now to a certain extent moving out and taking up abandoned farms in the neighborhood of New England cities. Many farms in Cumberland and York Counties, in

Maine, are thus being redeemed to culture, and children, old-fashioned tow-heads, one a year, are being contributed to populate the old red school-house on the hill.' This very year Vermont, guided by the success of New Sweden in Maine, is transporting a colony of Swedes over the Atlantic to settle on the abandoned farms of the Green Mountain State. New Sweden is in fact the first successful agricultural colony founded in New England by foreigners from over the ocean since the Revolution.

The American consul at Gothenburg, Sweden, furnishes me the followin detailed information:

The total emigration from Gothenburg to all points in 1889 was 24,998, and from January 1, 1890, to July 1, 1890, it has reached 15,425, all of which, with the possible exception of a very insignificant number, went to the United States.

The Swedish statistics as to the destination of emigrants are not thoroughly reliable, as all the destinations given by them for emigrants from Sweden are—besides the United States—Denmark, Norway, and Germany, to which countries they average yearly as follows: Denmark, 2,300; Norway, 1,500; Germany, 600, while all the rest are to America. A very small contingent formerly went to the Argentine Republic, but have now entirely ceased on account of the unfavorable economic conditions prevailing there. Australia has a slight percentage, a few hundred emigrating there each year, and Brazil has lately attracted a few, but it is insignificant as a whole.

It is estimated that the number of emigrants from Norway and Sweden this year (1890) will fall off at least one-third, as compared with the total of 1889. The majority of emigrants from this country may be classified as—about 10 per cent. from cities; some 7 per cent. as skilled artisans and mechanics; about 10 per cent. female domestics; and the remaining number farmers and common laborers, with their families.

As far as I know and can learn the Norwegian Government is apparently inactive in the matter of emigration, although, as I have mentioned elsewhere in regard to Sweden, I am perfectly sure that communities, municipal, and other authorities are very often instrumental in promoting the emigration of undesirable classes.

"As to the Swedish Government in this question, the laws regarding military service alone have considerable effect on emigration, as all the men in this country from nineteen to twenty-six years of years are obliged to perform some military service each year, and during this period they are denied a priest's certificate, without which it is unlawful for an agent to sell them a steamer ticket or forward them on a prepaid passage.

A steamship agent in Sweden is obliged to deposit a large sum, some 60,000 kroner, with the Government as security for any penalty that may be imposed for his disregard of the law. As a consequence, any man between the age of nineteen and twenty-six, wishing to go to America is obliged to make a special petition to the King, stating certain and specified reasons why he desires to emigrate, some of which are as follows:

"I am without work and means of subsistence, and have therefore concluded to emigrate to America, rather than become a burden to the community, as I have money enough to pay my journey with."

"I have concluded to emigrate because my father has a large debt on his farm, and in the hope of being able to help him pay off the same I wish to go to America."

"I have, through many sacrifices, succeeded in saving money enough for a ticket to America, and in order to assist my poor parents, that they may not become a public charge in their old age, I desire to go to America."

The number of applications to the King from would-be emigrants aged nineteen to twenty-six, subject to military duty, is large, and amounted two years ago to some 6,000. Although many permissions are granted, the number of applications has become too voluminous for speedy dispatch, and is continually augmenting, thus

further acting as an obstruction to this class of desirable emigrants. Possibly this is one object of this measure, as a somewhat similar provision in Finland, requiring the intending emigrant to make his application to the senate, is there admitted to be the intentional hindrance of emigration for the purpose of preventing a scarcity of the laboring classes.

A considerable number here, however, evade the law by going to Norway, Denmark, and Germany, and procuring further passage there. This will be found to be one of the causes of the discrepancy in the Swedish official returns of the number of emigrants from Sweden and the number of Swedes entering the United States as shown by the Treasury Department's statistics of immigration.

The nationalities passing through this port are Fins and Swedes. The number emigrating in 1889 were respectively: Fins, 7,000; Swedes, 17,998. Up to July 1, 1890: Fins, 2,500; Swedes, 12,925.

Although such things are difficult to substantiate, still, from my own observation and from circumstances I have heard related and occasional incidental accounts in the press, I am thoroughly satisfied that criminals, vicious characters, paupers, and other objectionable persons have been and are constantly being assisted to America for the purpose of getting rid of them; and I doubt very much if there is a single hamlet, village, or any other community, not to speak of the large cities, in the whole Kingdom which could not furnish instances of such a practice.

I believe this is principally done by private subscription by members of the community to rid themselves of objectionable characters; but I also am perfectly confident that it is done as well by the officials of prisons, poor-houses, and other institutions, for the reason that, careful as the press is about publishing anything reflecting unfavorably upon their country or institutions, occasional instances inadvertently, or in other connections, appear in print.

Mormon emissaries are continually at work in Sweden, but they carry on their operations very cautiously and secretly, as, if it becomes known that their proselytes have signed the contract or agreement with which they bind them, agents would not be allowed to sell them tickets to America. This difficulty, however, is obviated by such converts crossing over to Denmark and there taking the Danish (Thingvalla) line to New York. The number so doing is estimated by competent authority to have been about 500 in 1889.

There is no medical inspection whatever of intending emigrants. I have never heard nor can I learn of any one having been refused passage on account of his or her physical condition.

I have never seen a case of leprosy in Sweden to my knowledge, but, as a fact, it exists here to a considerable extent. Although the number of those afflicted with the disease can not be obtained, the statistics of deaths resulting from it, as given in the official statistics of the Swedish board of medical directors, show that, during a period of twenty-six years, from 1862 to 1887, there was a total of 873 deaths, averaging 33.5 per year. The latest figures available now are for 1887, when 16 deaths were recorded. A few weeks ago a female leper, upon her arrival at New York, was, most fortunately, detected and returned to her home, a few miles north of Gothenburg.

In Norway there are special hospitals or asylums set apart for this tainted class, and a noted Norwegian dermatologist estimates the number of lepers at the present time in that country at 1,000.

Beside leprosy, the only contagion of moment is smallpox, which exists in a sporadic form, and scarlet fever, which prevails constantly to a considerable extent.

Causes tending to the promotion of emigration seem rather to be increasing than diminishing in Scandinavia, and may be found largely in the economic conditions and the hard struggle of the farming class against the combined difficulties of worn-out soil, and adverse climate.

Compulsory military duty no doubt has a certain weight in the question—but as

the service is very light, consisting of a few weeks' duty each summer for a few years—its influence in this direction is comparatively slight.

Undoubtedly the main reason lies in the hope of bettering their financial condition and gaining more personal freedom, which accounts of the improved fortunes of relatives and acquaintances in America tend to strengthen and augment; while on the other hand statistics in Sweden show that the economic status of the people is not improving, as the number of paupers is steadily increasing; the latest records showing that 5.10 per cent. of the total population are a charge upon the public.

It has been stated before the National Economic Society in Stockholm that it is estimated that the cash capital carried out of Sweden to the United States averages 150 kroner ($40.20) for each emigrant.

During the period from October to March the number of emigrants from this port is as 1 to 7, compared with the remaining months. The largest emigration takes place in April, May, and June; and the lowest during December, January, and February. The lowest number of emigrants from this port in 1890 was, as is usually the case, in the month of January, and was 488.

During the months of June, July, and August the number of returning emigrants averages about 250 per week, and in November and December between 400 and 500 per week. The majority of these are supposed to be merely visiting Swedes, who come to spend a few weeks at midsummer, or Christmas, and return afterwards to the United States; but I am strongly inclined to suspect that some of these go over to work during the summer season in America when labor is in good demand, and come home to "winter over" where living is cheap. Reliable authority states that only about 3 or 4 per cent. of this number remain here permanently.

Of the emigrants leaving this port, about one-third have heretofore been forwarded on prepaid tickets, but this number seems to be increasing, as the emigration up to the 1st of July, 1890, shows the proportion of prepaid tickets to be over one-half of the entire number of passages. The greater portion of the assisted passages are for adults; such passages this year, up to July 1, show a total of 9,597, of which 8,572 were for adults.

To my mind, the provisions and regulations of our national quarantine system, and Marine Hospital Service, together with the instructions to officials abroad, tending to protect our people from contagion, seem very complete, and well adapted to the end aimed at.

The United States consul in Christiania, Norway, writing July 25, 1890, says:

(1) The total emigration from Christiania in 1889 to all points was 8,010; of these 7,985 left for the United States.

The emigration during the first six months of the present year was 4,605; of whom 4,579 emigrated to the United States.

(2) In 1889 11 emigrants went to South America (Buenos Ayres), 13 to Australia and 1 to Asia. In former years a larger number of emigrants has gone to Australia and a small sprinkling has also gone to South Africa.

(3) The emigration from this port to the United States will in 1890 hardly reach the figure of 1889, owing to the better times here and the increasing lack of working men in Norway and Sweden.

(4) In 1889 of 8,010 emigrants 815 belonged to this city and 4,807 came from other places in Norway, the most of whom probably from the country districts.

(5) From the official statistics on emigration for the year of 1887, when 10,789 emigrants of Norwegian nationality left this country, I see that 1,055 are classified as farmers, farming hands, or persons engaged in lumber work; 1,356 are skilled artisans, but besides these 4,511 persons are styled as day laborers or others, whose professions are not sufficiently given; most of these are in my opinion people from the country, belonging to the agricultural classes.

(6) The Norwegian Government has never made a single step to promote the emigration to the United States of paupers, criminals, and others to whom the United States object, or tried to do anything to retard or hinder the emigration of such emigrants who may become useful and desirable citizens of the United States.

(7) The nationalities of the 8,010 emigrants who in 1889 left over this port were given thus: Norwegians, 5,636; Swedes, 1,663; Americans, viz, persons returning to America after a short stay here in their native land, 711.

(8) As far as I know from an experience of about twenty years, no paupers, cripples, criminals, or other persons whom we do not want are smuggled through this port to the United States. I, however, had a single instance last year, and I call it an exceptional case, when I heard by an accident that the poor board of the town of Kongsberg had supported a troublesome person to emigrate to the United States. I immediately gave notice of it to the collector of customs of the port of New York, and the authorities there succeeded in finding the man somewhere in the State of New Jersey and of transporting him back to Norway, where I had informed the police authorities of the part I had taken in his sending back.

As a rule, I must say that the Norwegian authorities would not dare to send their poor or criminal ones to the United States in order to get rid of them, and that they are perfectly loyal to their duties towards the United States.

(9) The Mormons are still working here and I regret to say with some success. Their number at this city may be given as about 400, but the recruits for America go, if I am not wrongly informed, always over Copenhagen, which is the center of Mormonism in the north.

(10) The laws or police regulations of Norway order a medical scrutiny of all persons emigrating from the country, but I think it is only a very superficial one. The inspection, however, is enforced in every case. No emigrants have, to my knowledge, been rejected for disease during the past eighteen months.

(11) Of contagious diseases, scarlet fever and diphtheria have been prevalent for several years at this city. The sanitary board here is active and efficient, and the hospitals are modern and in good condition.

(12) The 8,018 persons emigrated over this port in 1889 were reported to have carried with them kroners 52,600, or about $14,000 in our money. Most of the emigrants and chiefly those who have had their passages prepaid in America, have very little money with them, carrying only a strong body and a cheerful hope of a bright future in the United States.

(13) At the beginning of the winter hundreds of Norwegians settled in the United States have for some years past returned to their old homes, but only to return to the new country after a short visit. Some, but in proportion to the returning emigrants very few of them, remain here enjoying the fruits of their work in America.

(14) More than half of the number of emigrants have assisted passages through remittances from friends in the United States. In 1889, when, as already said, 8,010 emigrants left this port, 4,148 had their passages prepaid from America, and the assisted passages were, in my opinion, more for families than for adults.

(15) Some precautions should, in my judgment, be taken by the United States to prevent the importation of leprosy from the western and northern districts of Norway. A stricter inspection of the emigrants should be made, and all emigrants hailing from the districts infested with that malady should produce a certificate from their respective boards of health or district physicians as to their own and their families' sanitary condition.

EMIGRATION FROM GREAT BRITAIN AND IRELAND.

For the eight months of 1890 ending August 31 as compared with the corresponding months of 1889 there was a decline of 7,426 in the total number of English emigrants to the United States; in Scotch emigrants a decline of 3,348, and a decline of 6,321 in Irish emigration. The total decline of emigrants of British origin in this period as compared with the corresponding period of 1889 was 17,195; the total for this period of eight months in 1890 was 106,123. No doubt the advance in wages in several callings in Great Britain wrested from British capital by the remarkable series of successful labor mutinies of the last half of 1889 and the early part of 1890 has had some influence on the emigrant movement from Great Britain, together with the prosperity of general business of which these successful strikes were an abnormal symptom.

This explanation appears to be reënforced by the comparative statistics of British emigration to points outside the United States, for it is significant that British emigration to Australia, British North America, and other points has fallen off in larger proportion than to the United States; showing that our country is yet considered to be a more desirable home for the best classes of British emigrants than any one of the British colonies, notwithstanding the tremendous amount of effort made in high and influential circles in the United Kingdom to swell the emigrant stream that flows outward through its chief ports. More than twice as many Englishmen annually settle in the United States as settle in the Dominion of Canada. Over four times more Englishmen have come to the United States to settle from January 1, 1890, to August 31, 1890, then have gone to Australia. In the past eight months upwards of 11,000 Irish have moved on points outside the United States, while this country has absorbed over half of all Scotch emigration. In round numbers the United Kingdom has sent to the United States in the eight months of 1890 above named about 60 per cent. of her total output of population.

But there is another important feature of this insular emigration. Hull, Leith, London, and Liverpool are points which are the lodging places or temporary homes of a large foreign emigration, most of which passes directly to Liverpool by rail from Hull, from Leith to Glasgow. London sends out comparatively few emigrants. The doors of British emigration swing from the west as well as toward the west. Liverpool is the great way station of the Continental movement that touches England. In the past eight months, from January 1, 1890, more persons of Continental races have sailed to points outside of Europe from ports of the United Kingdom than Irish, and almost as many as of Irish

and Scotch together to all points, and about 7,000 more than the English emigration to the United States for the same period. About 33 per cent. of ostensibly British emigration (*i. e.*, emigration moving abroad from British ports), is German, Scandinavian, Russian, Austrian, and Continental European.

The sharpness of English competition for the emigrant traffic is obvious when it is observed that in steam-ships sailing from British ports in the first eight months of 1890 upwards of 63,000 steerage passengers were induced to cross the North Sea or the English Channel in order to find the steerage of ships sailing particularly from Liverpool and Glasgow. The keenness of British zeal for the world's carrying trade is matched by its zeal in moving the world's uneasy population. It is no uncommon thing to find Babel reproduced in the steerage of an English steam-ship as she moves out into the Mersey bound for New York.

The comparative statistics of the eight months here being dealt with (which include the heaviest fraction of the movement for the entire year) reveal another interesting fact, namely, that while emigration to the United States from the English-speaking races has declined moderately in 1890 as compared with 1889, the emigration of races not speaking English has increased in general from most points, and in particular from points in the United Kingdom.

In the first eight months of 1889 there sailed from British ports 52,575 persons of continental races; in the same period of 1890 the number was swollen to 57,314. Exact statistics concerning the proportion of races concerned in this movement are not at hand, but there are indications that the proportion of Russian Jews is larger than in 1889.

The following is the statement of British emigration for the present up to September 1, 1890, issued by R. Giffen, esq., the statistician, and is dated September 4, 1890, issuing from the commercial department of the Board of Trade, London:

Return of the numbers, nationalities, and destinations of the passengers that left the United Kingdom for places out of Europe during the month ended August 31, 1890, *and the eight months ended August* 31, 1890, *compared with the corresponding periods of the previous year.*

MONTH ENDED AUGUST 31.

Nationalities.	United States.		British North America.		Australasia.		Cape of Good Hope and Natal.		All other places.		Total.	
	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.
English	11,773	11,886	2,296	2,823	1,824	1,935	812	1,520	596	732	17,301	18,896
Scotch	1,897	2,211	256	276	207	194	57	93	52	41	2,469	2,815
Irish	4,648	4,608	223	318	323	272	31	22	40	18	5,265	5,238
Total of British origin	18,318	18,705	2,775	3,417	2,354	2,401	900	1,635	688	791	25,035	26,949
Foreigners	8,067	6,439	910	564	30	51	220	233	119	137	9,346	7,424
Nationality not distinguished	......	1,232	......	......	......	......	5	.....	230	254	235	1,486
Total	26,385	26,376	3,685	3,981	2,384	2,452	1,125	1,868	1,037	1,182	34,616	35,859

Return of the numbers, nationalities, and destinations of the passengers that left the United Kingdom for places out of Europe, etc.—Continued.

EIGHT MONTHS ENDED AUGUST 31.

Nationalities.	United States.		British North America.		Australasia.		Cape of Good Hope and Natal.		All other places.		Total.	
	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.
English	56, 236	63, 762	14, 225	18, 284	10, 108	14, 298	6, 403	8, 192	5, 439	6, 806	92, 411	110, 842
Scotch	9, 769	13, 117	2, 020	3, 264	1, 405	1, 570	589	635	459	359	14, 242	18, 945
Irish	40, 118	46, 430	1, 292	1, 720	1, 710	1, 889	82	89	243	1, 717	43, 445	51, 854
Total of British origin.	106, 123	123, 318	17, 537	23, 268	13, 223	17, 757	7, 074	8, 916	6, 141	8, 382	150, 098	181, 641
Foreigners	57, 314	52, 575	7, 638	8, 273	230	344	1, 197	1, 032	1, 016	831	67, 395	63, 055
Nationality not distinguished	......	1, 232	......	......	......	......	6	3	1, 621	1, 716	1, 627	2, 961
Total	163, 437	177, 125	25, 175	31, 541	13, 453	18, 101	8, 277	9, 951	7, 778	10, 929	219, 120	247, 647

NOTE.—The above figures, being made up at the earliest possible date after the close of each month, are subject to correction in the annual returns.

Cycles of action and of reaction corresponding with cycles of trade affect emigration. There are periods in which emigration from the United States is suggestively large in comparison with the immigration. In the United Kingdom these cycles have been more definitely marked by statistics than has been done in the United States. A period of decline of emigration and an increase in immigration into Great Britain and Ireland is generally followed by the reverse. First, there is a rise from a period of low emigration with slight changes in immigration, then an increase of both; then a decline in emigration, accompanied by an increase in the returning current and finally a decrease of both, but net emigration, of course, being the largest.

The detailed statistics of British and Irish emigration in 1889 are suggestive: 20,219 married women, 24,458 children twelve years and under, and 14,642 married men last year emigrated from the United Kingdom to the United States, showing, among other facts, the increasing tendency of families to join their heads in the New World. The number of emigrating single men in that period was 69,218 and of single women 40,234. In the year's British emigration there were nearly 5,000 professional men and merchants and about 10,000 mechanics of the building trades. In the year 1889 the following numbers of continental races moving to the United States used British ports as a way station: 20,568 married men; 27,736 married women; 35,787 children, twelve years and under; 101,478 single men; 54,829 single women. Here is the same increasing tendency of emigrants in the United States to send for their families as well as a decided movement of the advance guard of married men. It is a fact worthy of note that there is a preponderance of male over female children in both classes of emigrants here alluded to. The variety of trades among these emigrants is wide, but unskilled labor of course enormously preponderates if we include in this class the land workers.

The largest percentage of emigration as compared with the population of the United Kingdom was in the period of five years 1881–1885 inclusive. The excess of males over females is considerable in the emigration from Great Britain, but the phenomenon of Irish emigration is the large proportion of females. In the past ten years the statistics of two years show a slight excess of women emigrants from Ireland. In the decade closing 1889 the percentage of children emigrants varied from 14.9 to 22.5. In that decade the excess of male over female emigration, both foreign (passing through Great Britain) and from the United Kingdom, to all points, was 791,141. In the same period 665,879 children from the same territory were poured into countries outside of Europe from the British Isles. If the Christian crusade was a unique religious fact of the Middle Ages, the children's crusade of the close of the nineteenth century is a unique social phenomenon.

There are curious roundabout movements of immigrants to the United States other than those hitherto mentioned, due to the competition of steam-ships for business. One of these is via Rotterdam. Many foreigners come from the continent to London, remain awhile, take small ships to Rotterdam, recrossing the channel, and thence sailing to New York. This route is extensively advertised and rates are low. In this way, especially, the undesirable congestion of the poor in the east end of London is relieved. There is no evidence of emigration being assisted out of public funds, but there are indications that private charity moves some who are liable to be a public charge from the east end of London to New York. The Wilson line from London carries but few emigrants—not over 1,000 a year to New York. The Allan line takes about 6,000 a year from London to Canada, of whom it is believed many are assisted. A very few Germans sail via London to the United States, such generally as fail to make both ends meet in London.

In reply to inquiries as to the emigration from and through Glasgow for the first half of the year 1890, the marine department of the London Board of Trade, the focus of British statistics, replies as follows:

In reply to your letter of the 29th ultimo, addressed to the principal officers of this department at Glasgow, asking for certain information respecting emigration from that point, I am directed by the board of trade to transmit for your information the accompanying statement showing the number of emigrants who left the Clyde for places out of Europe during the first six months of 1889 and 1890, together with a copy of the statistical tables relating to emigration and immigration from and out of the United Kingdom in the year 1889.

The board further desire me to state that they are not aware of any case where passengers booked by agents have been rejected except where the full fare has not been forthcoming or when more passengers have been booked than the ship could accommodate, in which latter case they are sent on by the next vessel. Passengers are, however, occasionally rejected by the medical officers as unfit to proceed on the voyage.

Statement showing the number of emigrants who left the Clyde for places out of Europe during the six months ended June 30, 1890, and the corresponding period of the previous year.

Destination.	*1890.	1889.
United States	11,218	12,364
British North America	1,780	2,479
Australasia	153	166
Other places	70	24
Total	13,221	15,023

* The figures for 1890 are given subject to correction.

EMIGRATION FROM GLASGOW.

In 1888 there was first prominent in Scotch emigration a well-to-do farmer class, worth from $1,500 to $4,000 each, together with young physicians and other professional men. Since that period many Scotchmen have taken ranches in the wild West, while many others have gone to Florida, where a Scotch capitalist preceded them in large purchases of land to which he has won many small purchasers of his own countrymen, now employed in orange culture and in raising vegetables for the Northern market. The climatic conditions in which these Scotch emigrants were reared would seem to forbid any very extensive movement of these people to Florida, but since the British occupation of India, the adaptability of superior races to all the inferior or enervating climates has been marvelously illustrated, so that it is disloyalty to the historic method longer to affirm that the Anglo-Saxon is incapable of the cotton field or the orange groves of our Southern States.

JEWISH EMIGRATION FROM GLASGOW.

Glasgow probably is the most crowded city for its space of occupation in Great Britain. Twenty per cent. of its population lives in one-room tenements and 45 per cent. in two-room tenements, and yet many a rural neighborhood in the north of Scotland sends more emigrants than does Glasgow. But Scotch emigration for several years has been declining, while the foreign emigration through the Clyde has been increasing to about 75 per cent. of the whole. The continental emigration via Glasgow is very largely Jewish. The United States consul at Glasgow recently discovered a Jewish family of five children with the mother in needy circumstances who were being aided to emigrate to the United States, and of course he stopped them by the assurance that they would not be allowed to land; but in all probability they have got there ere this by some other form of journey.

In single steam-ships from Glasgow for New York one finds as many as two hundred of these poor peasants from Russia, at least 90 per cent. of of whom are moved out of Russia by prepaid tickets or by passage assisted

by the Jewish benevolent societies, whose self-denying loyalty covers every child of Abraham, no matter what his condition in life may be. The masters of the world's banking are masterly in their charity for their persecuted race. If you ask these Hebrew emigrants (the men) what they propose to do in the United States, as a rule they will reply, "I shall sell." Most of them will be peddlers. The extent to which organic Jewish benevolence assists these pitiable Russian emigrants into the United States, I think, is not appreciated in our country. This great philanthropic movement within a race is at once a monument to the power of the better sentiments in our century, and a witness of the tremendous activity of persecution in effecting the solidarity of a nation without either a capital or a country.

A peculiarity of German Jews of the poorer class is this: That they become socialists as soon as they learn to read. The extremists of capitalistic centralization on the one hand, as well as of communal or of socialized wealth on the other hand, may be found in the Jewish emigrant. In one ship which recently left the Clyde for New York were Russian Jews too poor to have even an opinion, German Jews of well informed socialistic bias, and Jewish millionaires (the latter in the first cabin). The founders of German socialism were Jews.

A visit to the Jewish Emigrant Lodging Home, where the continental Jews halt for a night or two prior to the departure of their ships, enables one more vividly to appreciate the force of the foregoing. These emigrant lodging-houses in Glasgow, as throughout the Kingdom, are under police surveillance. At the side of the entrance to one of these Jewish lodging places in Glasgow one finds a locked door. Within is the cook-house, where a Jewess cook is preparing special food from meat slaughtered under ecclesiastical care. The dishes have never been defiled by Gentile touch. Only hind-quarters are used. An immense caldron is boiling with bouillon, unsullied by alien hands.

In the chief apartment of the lodging-house of which I am speaking I found perhaps two hundred emigrants, all from Russia, interviews with numbers of whom will resolve the types. Says one: "I am a carpenter; going to New York to join my brother." Says a second: "I shall go to Pittsburg to peddle." Sixty young girls are going to Pittsburg and Philadelphia to join friends. All of these people are miserably poor; not a few are barefooted and ragged, and most of them give evidence of having been ill-fed. One family reported having been driven from their German-Russian province by the Russian police for no other offense than that of race, and for no other fault than that of poverty. Permanent residence in Russia was denied them. They must be wandering Jews if they stayed in the Russian territory, and forced change of residence drove them to America. There was one very interesting and intelligent family, consisting of an elderly lady, her son, and daughter, whose father was in America and had sent them money to emigrate. There were fifty children in this group of Jewish emi-

grants. There was a consensus in substance like this: "We were all starving in Russia; persecution sought us out; we are fleeing to an asylum in the New World." It was impossible to look into their starvelingly-pinched faces without sympathy.

Various others of these emigrants, representing the more numerous body of males, reported themselves to be peasants going to New York without trade or purpose, knowing not what would become of them except that they should "peddle." The worst physical depression was a wretched, half-clad mother with three babes, triplets, the babes nude save a dirty kerchief tied about the loins of each. It is not easy to exaggerate the squalor and misery of these Russian emigrants thus corraled, as it were, apart, too lowly for other emigrant races, isolated in the lodging-houses and generally in the steerage passage. The condition of the steerage filled with such passengers during a long storm in the trans-atlantic passage I have personally witnessed at peril to sanity, sanitation, and digestion which decent language fails to portray.

In an apartment or in another compartment of the large room in which these Jewish emigrants were quartered in Glasgow were a group of Scandinavian emigrants, in striking contrast with the preceding group—cleanly, better fed, the subjects of comparatively good government and opportunity. Yet not a few of these Russian Jews may be seen in the decks of the steerage and in their lodging-houses, reading the Hebrew Scriptures or cowering behind the cordage and thumbing or re-reading silently or aloud to their friends the last letters that came to them before they entered on their exile.

The United States consul in Glasgow, referring to the "100,000 emigrants," more or less, "who annually leave the Clyde," writes:

> I have often walked along the quays of the Clyde especially to see what sort of people are emigrating to the United States. There is perhaps no port of embarkation for emigrants to the United States which needs more careful investigation than this, as steerage passage, I understand, is lower here than almost anywhere else.

The results of investigations in emigrant lodging-houses, re-enforced by the testimony of emigrant agents, such as will be given later on in describing the Liverpool movement, seem to justify the consul's suspicions.

I asked our consul in Glasgow to address to the various steamship lines in Glasgow taking passengers to the United States certain questions. The replies received were as below. It should be said that the Scotch who find the New World via Canada sail mainly by the Allan line. The letters alluded to read as follows:

65 Great Clyde Street,
Glasgow, August 7, 1890.

In reply to your favor of the 4th instant, we beg to inform you that the number of emigrants carried by our steamers this year is somewhat less than during the same period in 1889, the number being 4,720 this year against 5,280 in 1889. Very few of our passengers are to our knowledge assisted by any of the benevolent societies. We

have had to reject an exceedingly small number of applicants for passage, certainly not more than in the previous year, the chief reason being that they were of unsound mind. The largest proportion of the emigrants by our vessels, other than British, have come to us via Hamburg, and are chiefly Jews.

We are, yours, very truly,

D. A. B. MURRAY,
For the STATE STEAMSHIP COMPANY (Ltd.),
John Brace Murray, Manager.

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45 UNION STREET,
Glasgow August 4, 1890.

SIR: We beg to own receipt of your favor of this date. We, in reply, assure you emigration to America this year is less than it was during 1889. No benevolent society has forwarded any emigrants by our steamers.

We have not had any occasion to reject applicants for passages; all persons must pay their fares. Next to emigrants from Great Britain and Ireland we carry—in number—Germans.

Yours, very truly,

HENDERSON BROTHERS.
N. W. AITCHISON.

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25 BOTHWELL STREET,
Glasgow, August 6, 1890.

DEAR SIR: We duly received your letter of 4th instant and have pleasure in giving you the information you desire therein. The number of passengers carried by our steamers to United States ports during this current year is less than carried during the same period of 1889. We have had no passengers sent to the States under the auspices of benevolent societies.

We do not keep any record of persons to whom we refuse to grant passages, and we are therefore unable to give you the number rejected. After British passengers the majority of emigrants by our steamers to the States were Scandinavians.

Yours, truly,

JAS. & ALEX. ALLAN,
Per N. H. DUNLOP.

EMIGRATION FROM LIVERPOOL.

It is in Liverpool that very suggestive studies of the transportation of all grades of population may be made and where there may be found the most diverse and varied social and economic conditions between the short strides which separate first cabin from second, and second cabin from steerage. Probably over a thousand steamships in 1890 have been concerned in bringing steerage passengers to the United States and perhaps well-nigh to a thousand to the port of New York alone; but in no port do transatlantic voyagers swarm as they swarm in Liverpool. If many races converge in this movement through other ports, all races converge here to move on the New World.

The disposition of the chief representatives of foreign steam-ship lines toward the United States is generally kindly, so far as my observation has extended. Especially is this true of the German and Bel-

gian lines, as well as those of southern Europe. But an exception must be made in this respect in the case of the representatives of one or two of the trans-atlantic lines centering in Liverpool. One line refused, point-blank, to make any written reply to certain inquiries not hitherto supposed to have been impertinent. Another line appeared to view as an impertinence what was requested as a courtesy. It would seem that great trans-atlantic lines doing such enormous and profitable carriage to the United States might wear an easier-fitting collar even when condescending to the humblest person authenticated by the State Department and authorized to prosecute certain lawful inquiries.

I am glad to say that the central foreign office of but two of the many lines of steam-ships engaged in the forwarding of European emigrants displayed absolute irritation, while a third froze out inquiry with frigidity of courtesy. I was enabled, however, from other sources to obtain interesting facts bearing on emigration from Liverpool. It should be added that the irritation and frigidity displayed perhaps may have been due to the fact that the steam-ship lines alluded to have been among those forced to bring back to Liverpool from ports in the United States persons whom they carried out in violation of our laws. The courtesy of the Liverpool heads of the Inman and Anchor Lines was in such marked contrast to the discourtesy of two other lines that simple justice requires this mention. The White Star Line also readily acceded to my requests; but as I was unable to cover the whole ground through the steam-ship lines, I dropped that method of inquiry altogether in Liverpool and sought out unofficial and lay persons connected in some way with emigration. The most interesting feature of these Liverpool inquires relates to Mormon emigration, of which I will speak later on, in this section confining myself to other features of the Liverpool movement.

An emigrant sub-agent thus speaks:

Many excellent emigrants pass on to the United States through Liverpool from Scandinavian nations, especially from Copenhagen via Hull. I think, as a rule, there has been an improvement in the quality of Liverpool emigrants. Large numbers of good, skilled farmers are joining what I call the skilled-labor movement to America. I believe the great majority of passages hence areprepaid. There is a steam-ship syndicate which divides the continental steerage traffic on a certain basis. I have seen shabby looking emigrants in the steerage, whom you would have fancied quite penniless, who had $2,500 in their belts. It does not always do to conclude regarding the Jewish peddlers, for instance, that they are poor, though in most cases they are; but some of them try to make you believe they are paupers, when in fact they have a good supply of money. They carry their own utensils on board ship, brew their Russian tea, and live on an especial diet. We forward passengers, third class or emigrant, for $40 from Chicago to Copenhagen, and $75 for the round trip, rail and steam-ship, thus securing a considerable returning and tourist stream of the emigrant class.

There is a society in London with branches in Liverpool which gives assistance to get rid of European paupers or poor that might otherwise become a charge on English cities. Many of the Poles and Russians, the poorest of their class, come here via Hull to sail for the United States.

The scouts of booking agents are plenty in Great Britain, and in the sea-ports especially. Nothing that can be done is omitted to get anybody and everybody to buy a ticket for "the States." Yesterday I saw on board ship bound for New York a woman and child who were penniless, having only their prepaid passage, but they expected to reach husband and father in New York.

The evils of immigration are largely perpetuated by large contingents of persons more interested in increasing the quantity than in improving the quality.

I do not know how much reliance can be placed on the following statements made to me by a veteran emigrant drummer of Liverpool, but as they cover a ground on which it is very difficult to get exact testimony and confirm suspicions which exist in the minds of many United States officials in Europe, I subjoin them:

I think that at least one hundred very objectionable emigrants leave Liverpool every week for New York. Some of these, and perhaps the most objectionable, are British paupers assisted by benevolent societies; some of them are ex-convicts, but the most of them are paupers from the continent—I mean persons without a cent of money or an outlook or trade or habits of industry or of self-support. There is an agent in Liverpool who takes ex-convicts, sees them on the ship, and pays them their 'good behavior money,' after paying their passage to the United States. They are furnished with a new suit of clothes, and are given to understand that they can do better abroad than at home. They have something over and above their tickets. The Government is not concerned in this matter, but they get to America on British funds.

No, there are no Liverpool paupers sent hence to the United States, so far as I know. You can not get a Liverpool pauper out of Liverpool with a ship's windlass. They will stick there and starve rather than go abroad. It is the European (continental) poor and the English country poor that are mainly included in the poorest emigration. The sub-agents have a hard time to get a living because there are so many of us. We get 5 per cent. and the agents who do no work get 7½ per cent. There are drumming agents in every village in the country, urging men and women to emigrate. Some do not decide where they will go until they get to Liverpool. They sell their little all for what they can get and hurry off. We pick up a few of the floaters here in Liverpool. We have pamphlets and give information. I have known of criminals whose term was shortened for good behavior who are dumped on the States. Poor rates are so high in England that those outside official quarters are interested in seeing off those likely to become a public charge as well as those who have become such charge.

On board a ship about sailing from Liverpool to New York were two emigrants about whom there was some confusion. There was a division reported in medical judgment. The physician of the Board of Trade declared them unfit to proceed; the ship's doctor could find no reason why they should be prohibited. It was not announced whether these persons sailed or not; but the incident shows that a medical examination under United States auspices at European ports might keep our Government in better touch with the problems or the factors of the problems of emigration.

On the same ship were several drunken men so disorderly that the police ordered them into secure places in the steerage below.

On the other hand, some of the first-cabin passengers on this ship were returning emigrants who had gone to the United States in the

steerage on a former passage. Larger numbers on the ship here referred to were making their second journey to the United States.

Our Consul at Liverpool writes as follows:

Emigration in 1890 will not, in all probability, be nearly so large as in 1889. No statistics are kept at this port as to the classes of emigrants; so it is impossible to give any estimate of the proportion of those leaving cities—of artisans or of farmers. It is also impossible to say what dangerous classes from the continent reach America. From all that can be learned on the subject paupers are not assisted to emigrate by benevolent societies, nor is there any contract labor sent from England to America. Cripples are certainly not sent over. But it is impossible to tell about the emigration of dynamiters.

As usual for thirty years past, Mormons are going to the United States this season. They come from all parts of Germany, Scandinavia, and Great Britain, and indeed from almost everywhere. They are recruited by missionaries, who preach openly throughout this country.

All emigrants are subjected to a careful medical examination before leaving this port, and any one suffering from a contagious disease is refused transportation to the United States. No case of leprosy has been heard of at this office.

There is no means of ascertaining the average amount of money that emigrants take to the United States. It is well-known that most of them go out to the far West and pay their own railroad fares to such distant points, besides having enough money to start life in new homes, so it is to be supposed that a large class of emigrants are thrifty and industrious.

The difference between summer and winter steerage rates hence to the United States is very small, a couple of dollars at most. The steam-ship companies here greatly desire to transport the Scandinavian emigrants to the United States, but ships going directly from Scandinavian waters compete as keenly as possible for this class of passengers.

IRISH EMIGRATION.

Queenstown is the point of embarkation of Irish emigrants almost exclusively, and comparatively few Irish emigrants sail from any port out of Ireland. The emigration from Queenstown in the first half of the year 1890 was 20,676, which is about two-thirds of the gross emigration from that port in 1889. There is but very little emigration from Queenstown to any other country than the United States. Eleven hundred more saloon passengers arrived at Queenstown in the first six months of 1890 than in the corresponding period of 1889, while there was a falling off of 6,500 in the number of steerage going out in the same period. By far the larger number of emigrants to the United States from Ireland are young men and women, unmarried, of the farming and laboring class. Only about 5 per cent. of the Irish emigration is skilled workmen, a respect in which English and German emigration is superior.

The United States consul at Queenstown reports that in 1890 he has learned of no Government assisted or pauper emigration to the United States, although he states that occasionally local poor-law guardians assist worthy young girls reared and trained in the work-houses, to

emigrate as servant girls. As a rule the emigrants from Ireland are looked upon at home as the bone and sinew of the country and their departure is deplored. I have heard of no Mormon recruits embarking at Queenstown. Such is the great stress laid in Ireland on chaste monogamy it is doubtful if ever the Mormon propagandist would be tolerated in the country.

The consul further remarks:

All emigrants or intending emigrants are inspected and scrutinized by a medical officer appointed for the purpose, and I am informed that occasionally such intending emigrants are rejected on account of disease or for other causes, and forbidden to proceed on the voyage. Leprosy appears to have been common enough in Ireland some centuries ago, but I have heard of no cases in the country during my residence here. I have had no occasion for several years to report to the Department of State cases of contagious disease. Many emigrants go to the United States reasonably supplied with money. Four guineas is the usual rate of steerage passage to America, though I believe one or two lines take steerage passengers for 3 guineas. The proportion of prepaid passages must be very large—mainly for families. The younger grown members are first assisted to emigrate, and then, finally, the small children and parents. I have personally known two families which have thus emigrated, the emigration of the entire family covering a period of three or four years. The remittances in these cases were from one or more elder children who had gone out in the first place and who then assisted brothers and sisters somewhat younger to emigrate, and finally the parents, with small children.

I visited an emigrant agency in Cork and was struck with the variety of the inducements for emigration offered in the literature on the walls. Just before the sailing of steamers from the neighboring harbor of Queenstown, half an hour distant by rail, these agencies abound in suggestive pictures. A subagent enters one of the Cork agencies and remarks: "Here is a poor boy; he wants to go to St. Louis."

"What St. Louis?" asks the agent. "There are several St. Louises in America." The boy doesn't know, but finally it is discovered that it is probably St. Louis, in Missouri.

"The boy hasn't money enough to within 4 shillings," says the subagent. "Let him go." The boy is booked.

The emigrants are numerous who run thus close to the wind.

One of the subagents remarks:

The British Government helps evicted peasants to get out of the country, wherever they want to go. Those who have gone to Buenos Ayres have been badly cheated. The Irish Nationalists use their influence to prevent the evicted from emigrating.

A tour in the interior of Ireland reveals social and industrial conditions which indicate that, although Ireland has lost nearly one-half its population by emigration, the improvement in the status of those remaining is not so marked as to give reason to believe that there can, for the present at least, be any diminution in the Irish transatlantic movement. Cabins without roofs, dismantled farms, and a frequent recurrence of other signs of social disorder, give no reason to hope for immediate improvement in the Irish status. At Tipperary the spectacle is an industrial siege and a social anomaly, valuable brick blocks

being closed and barred while a new town is being built of the same materials five minutes' walk to the west.

The upper windows of some of these "erected" blocks give evidence of frequent brickbats or of collision with other untoward accidents. Add to the social and industrial warfare the extreme poverty of the peasantry, accentuated by the potato blight, which this year has nearly cut off the habitual food supplies of the west of Ireland and greatly reduced the supply of usual food in the eastern half of the island where the potato disease has done less injury; that the number of assisted passages to the United States under the existing conditions in Ireland is likely considerably to increase in the next year is not unlikely, unless causes of a conservative nature not now visible shall begin to operate, in aspects not a few Ireland yet remains the saddest land in Europe, and a striking illustration of the mischiefs that result from carrying all one's eggs in one basket.

Without diversified industry, neither governed nor ruled, an almost purely agricultural people, and an agricultural people relying too exclusively on one crop, the potato, Ireland presents aspects of morbid suspicion, and of dislocation affecting all forms of life, which render a journey in country or town painful even to a superficial observer. A sort of guerilla warfare in many parts of the country attests the consequences that follow eviction, and the frequent evictions further influence the public mind. These generally occur at an early hour in the morning, those in a state of siege pouring hot water on the attacking officials, who finally end the contest by battering down the cottage door, unroofing it, and setting the household goods by the wayside, amid the jeers of the accumulating populace.

I found that in order to get any information on Irish emigration or related themes it was first necessary to dislodge from the mind of the native a strong force of distrust. As I happened to have letters from an Irish member of Parliament, I was enabled to open many mouths that otherwise might have been closed. Standing beside a chimney in the Irish country, the sole evidence that once a peasant's cottage stood hard by he remarked: "I advise you not to talk with everybody; but if you get hold of the right persons you can learn something." The atmosphere of these districts is sad, and the population sullen and gloomy. "Lend me half a crown an' I hope ye'l live till I pay ye" screamed a poor fellow from the hedge as our jaunting car bowled along the country side, Irish wit yet penetrating the dense gloom.

An observer of the emigrant class as they appear at Queenstown says:

The emigrants as a rule are not ragged; they are able-bodied, fairly intelligent; I think the majority can read and write. They proceed largely to the interior of the United States, because there is offered a better chance for a home. Few return except for a visit. Those who come back, as a rule, are more dissatisfied with Ireland than they were prior to their emigration, I think a better class of Irish emigrate than ten years ago. Ninety per cent. of the Irish emigrants are "prepaids." Most of them

know where they are going and have friends to meet them on the other side. The worst lot of Irish emigrants that ever left this country were assisted to Buenos Ayres about two years ago, and they had a lot of distress. Some persons here think that emigrants should be required to take out consular certificates backed by the certificate of the priest.

Of course Great Britain likes to run the Irish out of Ireland to ease up the Irish question. A few years ago assisted Irish were shipped by the wholesale, but now there is more caution. Poor law guardians, it is said, sometimes forward children of tender years from workhouses in Ireland to convents in the United States. On the occasion of a strike in Dublin some time ago, trade unions helped many strikers to emigrate. At the time of the bakers' strike in Cork, some of the bakers were driven to the workhouse and were taken from there by the trade union, as I am told, and forwarded to the United States; but of course such men could not be rated as paupers, and 95 per cent. of Irish emigrants are farmers. I know of cases where American employers have prepaid passages to the United States on behalf of friends in the service of such employers in America—the employer running his risk of reimbursement in the labor of the emigrant thus assisted. I know of no syndicates in Ireland for the prepayment of passages, but agents enlarge a good deal on the glories of America.

In 1883 British workhouses were emptied on the United States quite extensively, but now not so. Even in Government assisted emigration many who had money imposed upon Government, and I think not over 10 per cent. of this Government assistance consisted of pauper emigration, but largely of those who were in temporary distress.

The emigrant agents in Queenstown generally are publicans running grog shops with lodgings attached. They go up to Cork to attend to their customers just before sailing of ship. Some of them I found communicative, but the wife of one of their class uproariously intercepted an interview, evidently suspecting that her husband was parting with information that menaced the business.

MORMON EMIGRATION.

The European rallying point for Mormon emigration is in Liverpool. In that city the Mormons have a chapel, eleven elders, and a large lodginghouse for converts. They also have a printing house where tracts and the Mormon bible, in several languages, are said to be printed. They send their elders from Liverpool to the south of England and into Wales and Scandinavian countries, where evangelizing centers are maintained, some of them permanent. They work quite exclusively in the country and village districts.

A Liverpool gentleman, who for years has had opportunity to observe the facts, says:

They formerly directed their attention to securing pretty girls as converts. I have never seen among emigrants so many handsome girls as a few years ago joined the Utah movement from Europe through Liverpool, but since the legislation in the United States against polygamy a great change has occurred. Fewer young women are now being conducted from this side by the Mormon elders, but the Mormons are now taking families to America. They are quietly brought to the Liverpool lodginghouse from the Continent or from Wales and carefully guarded from outsiders so that nobody can get at them. Their headquarters here are at Islington.

How do they work? Well it is somewhat after this manner: They hold protracted meetings in the various country places, and when they have won hopeful converts in any number they form social centers, get contributions from the neighborhood, and when a convert wants to go to the promised land he is assisted to move to Utah. The converts, however, go in conducted groups, under strict surveillance, as already intimated. It seems to me that this Mormon emigration is in violation of the spirit of your contract-labor law, but perhaps it is an evasion that can not be reached. The people who go to Utah talk about "going to Canaan," and I know of some who were not very soundly converted to Mormonism, but who have taken this course to secure a cheap journey to the United States, abandoning the Mormons shortly after arriving in your country.

These Mormon emigrants I should not call an undesirable class of people. They are from poor farming communities, and take this as a last chance for economic improvement rather than as the sure route to the kingdom of Heaven. They handle money very parsimoniously; indeed they have less money to spend here in Islington than they did a few years ago. They send out more emissaries at present into Wales than into any other country. The rank and file go out to America in the steerage, but the elders go first or second cabin.

In order to get at these Mormon emigrants more definitely I took a ship of the Guion Line (which the Mormon emigration seems to prefer). The ship of the Guion Line referred to was the *Wyoming*, having on board one hundred and twenty Scandinavian converts to Mormonism

beside a smaller number, probably of other nationalities, under the charge of several elders who sat at the tables in the first cabin, sailing from Liverpool to New York about the middle of August, 1890. My journey ended at Queenstown, but there was opportunity to observe and converse, although not of the most unobstructed kind, for every attempt at conversation with the elect was carefully watched by the elders, jealous for the spiritual validity of their flock. In several cases the converts were warned to keep their mouths shut, and attempted interviews intercepted or partial interviews interrupted, but enough vessels were found to be leaky to distill some interesting clews.

One of the Mormons encountered on the foredeck amid a collection of ragged Jews, on whom the light according to Brigham Young had not yet dawned, said:

For seven years I have been in the Scandinavian work, holding meetings and converting people to the true faith. We shall have another company of converts coming to Utah by Liverpool next month (September), but that probably will be the last party for the year. We are bringing over about 700 converts from Europe each year.

I was born in Norway, but for the last seven years, as I said, I have been in Norway, before that in Utah. The Bible says "the people of God shall suffer persecution," and I expect it. The United States Government is not alone in this persecution. We live in an atheistic and wicked age. I think "the last days" predicted by the prophet are nigh. As I read the Scriptures, that is the way it looks just now.

The sentence was left incomplete and probably never will be finished. One of the elders from the first cabin had caught us in the act; he beckoned to the Scandinavian to come to him. I had all I wanted. The story of Mormon propagandism in Europe is told. The substance of it is that polygamy is in decline, and that hardly one shipload of Mormon converts per year is the present fruit of Mormon evangelism in Europe.

THE JEWS IN EUROPE AND IN THE UNITED STATES.

The attempt to propagate race antagonisms in the United States has been most successful in those sections of our country where schoolhouses were scarce, illiteracy most pronounced, and where the dominant race was more prejudiced against honest toil. The remedy for prejudice against a race is mutual improvement in the intellect as well as the restoration of normal power to the heart. There have been attempts to import to this country the European intolerance of the Hebrew, but these attempts have not been successful. There is abroad in this country an ineradicable determination to take men for what they are and to give every citizen fair play.

If a certain Jew is a better man than a certain Gentile he has the benefit of his superior personality. Jacob or Esau, Isaiah or John, Saul or Paul, we give the modern Jew the fair chance that we give the He-

brew of the other dispensations. But on the continent of Europe this is not the case. Germany and Austria are driving the persecuted Jews, who are fleeing from Russia, from their frontiers, and this unhappy population is necessarily driven to the sea. In every ship now crossing the North Sea these refugees may be found. England is deeply exercised because she is getting the largest contingent. The latest word is that Russia affirms that she has adopted no new policy; but there are unmistakable signs that the Czar means ultimately to employ all the force there is in the anti-semitic laws of 1882.

If the Hebrews, who have so long been the scapegoats of religious and social fanaticism, are expelled from Russia even by the slower process now meditated, the total irruption of European paupers on Great Britain, and finally to a very large extent, on the United States, will be none the smaller.

To understand the situation of the Jews in Russia we must reflect a moment on the history of the Jews in that country. It should be said that the policy of Russia always has been to Russianize, and that means a good deal, even to orthodoxy. Of course, the Jewish rabbi resisted all Russian attempts to touch the distinctive traits of Judaism. But the Jews are a progressive people, despite rabbinical conservatism.

The school of Mendelsohn and the splendid personal influence of Sir Moses Montefiore in Russia were beginning to show fruit in a certain adaptation of Jewish thought to Russian control, a receptivity at which the frigid Russian Government began a little to thaw. Yet the old restrictions were unrepealed though suffered to fall into desuetude. All Russia was by no means open to the Jews for residence, but Jewish colonies settling in cities hitherto prohibited were tolerated or winked at. Beside every station of a newly constructed railway groups of three Jewish families were suffered to reside. At the university Jews were educated and learned to speak the Russian language. But the Jews were not suffered in any public position. A servant of the State no Jew could be, no matter how able, how learned, how wise and good. The sacrifices of the Jews in Russia met neither social nor political sanction; they were tolerated, and that coldly. Hence poverty and despondency in the Jewish race in Russia were intensified.

When the nihilist agitation broke out there were in the university young Jews burning with indignation at the injustice imposed on their race. Some of them naturally became nihilists. The race has for ages been dreaming of a political kingdom of God. That these idealists, hungry for progress as well as short of the bread that perishes, should be carried away by a quick sense of injustice and hereditary visions, is not a grave accusation. At once the Russian Government soliloquized: If giving the Jews some opportunity of knowledge and a slight taste of equality, turns them into nihilists, what would not be the disaster of further extension of Jewish autonomy?

Such is the background of the panicky movement of the Jewish Rus-

sians now in progress. I reiterate that diplomacy exercised upon Russia, rather than repression exercised at Castle Garden, in my judgment, is the true foil of this alarming irruption of pauper immigrants. The resuscitated edicts against the semitic population of Russia may at any moment be made sweeping by the interpretations of the bureaucracy.

In the present year (remarks a Russian Jew) the officials have terribly aggravated the severity of the laws by including many hundreds of small townships in the category of rural villages and expelling the Jews therefrom. Tens of thousands of Jewish homes have already been broken up. No Jew can own a farm or land, and thus every Jewish landed proprietor will be reduced to beggary, while to Jewish agricultural laborers there is no other recourse than an exodus to the sea which no longer miraculously divides to give them riddance of the modern Pharaoh. Hitherto Jews have been allowed to reside in but sixteen provinces, but by special grace Jews of the merchant class were suffered to live in commercial centers where they had long been established. But the anti-semitic movement of 1890 peremptorily expels from their homes in the sixteen 'Gaberania' many thousands of families, artisans, and workers, as well as traders. Jews are prohibited from mining industry and from all educational advantages as well as from becoming engineers or lawyers or army surgeons. The policy of Russia is extermination of the Hebrews in Russia—enforced pauperization—and if the execution of these despotic edicts is now and then less severe, the ultimate result will be the same.

The Israelitish Alliances in Berlin, Paris, London, and other cities, are doing a noble work in assisting their persecuted countrymen, many of whom are going to Brazil and Algeria, as well as to England and the United States.

In the chief cities of Europe there are benevolent Jewish societies for the aid of needy people of that race, both in the journey from place to place, from port to port, and to assist them in times of destitution. The Jewish Board of Guardians for the relief of the Jewish poor in London, and "the Poor Jews' Shelter," issue annual reports which are of value, as showing the tendencies and extent of pauper emigration. In 1889 the Jewish Board of Guardians in London relieved 445 natives of London; 1,197 foreigners resided in London seven years and upwards, and 1,328 foreigners resident less than seven years; in all, 2,980. In 1888 there were 3,513 cases of Jewish want relieved by the same guardians, the decrease in 1889 being most marked in regard to foreigners resident in England less than seven years. This decrease also is in Russians and Poles who have been swarming in menacing numbers in the east end of London. In "removing" poor emigrants from London it is stated that Jewish benevolence expended $3,170 in 1889, 252 persons having been helped "onwards" and 402 having been helped homewards.

CONTAGIOUS DISEASES.

The alarming spread of leprosy under the operation of timidity and cruelty in earlier ages in the orient and in the middle ages in Europe reveals the close connection there is between philanthropy and individual as well as national welfare, as one compares those results and their causes with the fact that under the laws of pity and benevolence applied with scientific wisdom leprosy in the two last centuries has been almost extinguished from the civilized world. It is true there are yet a few lepers in Europe, particularly in Norway, where by philanthropic science the number has been reduced from 3,000 to probably less than 1,000 within the memory of physicians who first began scientifically to treat the leper in Norway about thirty-five years ago. It is not yet settled that leprosy is contagious but it is treated as though it were contagious, and observation of the spread of many diseases formerly supposed to be wholly hereditary, shows that there is a power in semi-contagion as malign as in diseases well understood to be contagious.

On the continent of North America leprosy exists in New Brunswick but in the lazaretto at Tracadie it is declining—only 20 patients being reported there. In the Sandwich Islands, probably, leprosy is now more menacing than in any part of the northern hemisphere; but the movements of the past year are a new assurance that its decrease even there is certain.

Of all forms of plagues which menace the United States, we shall continue to have more to fear from cholera than from all others combined. Evidences are not wanting that the westward emigration of cholera, which began in 1888, continuing in 1889 and in 1890, may be renewed in 1891.

All things, accursed as well as blessed, seem to come out of the sunrise, only to seek the sunset, and the history of epidemics shows that cholera is no exception. Whether its entrance into Europe in the summer of 1890 was epidemic or pandemic, we know how prodigious are the efforts required to prevent the bacillus from leaping over seas as well as continents, in the fleets of oceanic caravans which follow "the ship of the desert." Hardly had La Grippe felled her first Russian victim when that Amazon among the bacilli got full grip of Yankees in the new world. I have already indicated certain precautions that may wisely be inaugurated without unnecessary delay against the movement of cholera to America in 1891. Especially disinfection of rags, whether in the hold of the ship or on the backs of emigrants, would seem to be a precaution which ought to be insisted on before ships from Europe are allowed to land, either cargoes or emigrants, at such times as the present.

The rapidity and ease of locomotion in the modern world are an added source of peril because the oriental occasions of the generation of pestilence are as active as ever in the midst of European commercial energy in the Orient. For example, the Hindoo and the Mohammedan are as devoted to their sacred shrines as ever, and their pilgrimages have quite the same commercial as well as religious popularity that they possessed centuries ago; while beside them are the great fleets of Indo-European commerce, hastened by steam through the Red Sea and the Suez Canal. As soon as the religious ceremonies at Mecca are concluded, there follows a vast fair, and for weeks all Mecca is busy loading and unloading caravans for the interior, and Jeddah is thronged with shipping.

Many pilgrims welcome death in Mecca as an answered prayer, the crowning desire of every believer's life. It is but few days by steam from Jeddah to Naples where all nations meet. The rags of the Old World easily find the New World in a week; the rags of the Orient find the Occident in half a month. It is evident that a little carelessness in 1891 may prove a costly luxury.

REGULATION OF IMMIGRATION.

Scattered hints, suggestions from various sources have been given in the foregoing pages concerning the regulation of immigration. It is now proper to sum them all if it be possible. In general, it may be said, the regulation of immigration already in force in the United States could well be supplemented by the regulation of emigration through our consular officers in Europe. It would seem that the best way to reach the immigrant is to reach him before he has come into the immigrant condition—even before he has touched the ship that is pointing toward these shores. Many plans have been suggested to effect this result.

One suggestion is this: That the intending emigrant be required to give notice to the nearest consular office of his intention to emigrate, upon which our consular officials shall institute inquiries regarding his fitness for American life, his character especially. If the inquiry is satisfactory, the consul shall issue certificates in triplicate, one to be retained by the office issuing it, one to be given to the emigrant, and the third forwarded to the collector of the port where the immigrant will disembark, none being allowed to land without a certificate. This plan obviously would be cumbersome, expensive, and must retard emigration as a whole, which perhaps would even commend it to some.

The proposition to exclude those coming on prepaid tickets (if not evaded, as it easily could be) would exclude about half of our present emigration, and my observation in the emigrant lodging-houses of

Europe tends to strengthen the impression that if such an exclusion were practicable it would not improve the quality of the emigrants, as but a very small part of that poverty is voluntary or due to the fault of the impoverished.

Another suggestion is the imposition of a head-tax of $1 or more on every immigrant. The 50 cents head-tax now paid by the steam-ship companies probably has a better basis in reason than the attempt to further burden those whose backs are already breaking. Some of our consuls in Europe, however, favor the proposition for a head-tax.

A modification of the certificate plan, proposed by one of our consuls in Germany, is to require the emigrant to present the proof of his moral fitness for American citizenship, thus relieving the consuls from the endless labor of independent investigation, except in suspected cases. Under this plan the intending emigrant would present to the consul a certificate under the seal and signature of the local authorities nearest his residence that he is sound in health and in mind, physically able to earn a living; that he has sufficient means to support himself and family until he can obtain employment; that his character for honesty, industry, and obedience to law is good; that he emigrates voluntarily and is not assisted; and is not under contract to perform labor in America.

Mr. George L. Catlin, our consul at Zürich, proposed to the Congressional Committee on Immigration a scheme of consular supervision of emigration which "seems perfectly practicable for a small country like Switzerland; and with the help of this law and the active good will of the Italian authorities, it might be made to work well in Italy." Mr. Catlin's plan is in substance the following:

(1) Every person intending to emigrate to the United States must declare his intention at least three months beforehand to the nearest United States consul; bringing with him an official certificate from the mayor or other officer of his town, showing him to be a person of good character and standing in the community.

(2) The applicant's declaration of intention—specifying domicile, occupation, names of parents, whether married or single, whether ever sentenced for crime, etc.—is to be made in triplicate.

(3) The consul makes inquiries and if the replies are not satisfactory refuses to authenticate the applicant's declaration.

(4) If satisfactory the consul authenticates, keeps one copy, returns one to the emigrant, and sends one to the United States Treasury or custom-house. The emigrant's permit serves as his permit for landing.

Consul-General Schuyler says:

Most of this information would be furnished, according to the Italian law, by the contract with the emigration agent. What remaining information is desirable could probably be easily obtained if our Government were to enter into a diplomatic agreement with Italy for this purpose. The regulations which are required by the Italian law, and which must be made in order to carry it out, could easily be so worded as to compel the communal authorities to indorse on the emigrant's passport or application all the information which we should need.

In the general conclusions which I have reached from European observation our consul in Gothenburg is concurrent. In reply to inquries propounded in July, 1890, Mr. Man writes as follows:

> Relative to the examination of emigrants, for the purpose of weeding out such as are unwished for, I think it would be most effective to have restrictive measures applied in the country of the emigrant's origin. One reason is that any obstacle in the way of an unworthy emigrant undoubtedly would have more effect in the country where he resided before emigrating to America and while deliberating that move, when a slight thing might affect his decision, than after he had left his own country and traveled thousands of miles to a strange one.
>
> The idea that I believe to be feasible would be to require the intending emigrant to file with a consular officer, on suitable blanks prepared for the purpose, a declaration of his intention to emigrate to the United States, containing name, age, occupation, parish of his registration, and also that he had never been in a jail or poorhouse, together with such other data as might be deemed appropriate, with a notice to the effect that he would have to take an oath to the matter contained therein, before the consular officer, in order to obtain a consular certificate; this to be filed a certain time before emigration, say three months. At the end of this time for the intending emigrant to be obliged to appear personally before the consular officer and swear to the contents of the aforesaid declaration, and such other matter as might be deemed pertinent. Upon his complying with these conditions satisfactorily to be furnished with a certificate giving him a prima facie right to land in the United States.
>
> This I believe would have considerable effect in lessening the number of undesirable emigrants, although, of course, it could not be made infallible, as at the large emigrating centers it would be impossible for a consular officer to examine, with any degree of thoroughness, all emigrants, but the very fact of being subjected to these formalities would have a deterring influence upon the classes we do not want, while not interfering to any extent with those we do.
>
> The same objections liable to be met with in this subject are often raised to the consular certification of invoices, viz, that such a number, representing such a variety of merchandise, can not be thoroughly examined by any consular officer, however expert; but no one conversant with such matters doubts for a moment that consular supervision has saved and is saving our Government millions of dollars, the fact alone of being obliged to sign a declaration as to the value, etc., of merchandise acting as a restraint upon undervaluation.
>
> Regarding the emigrating class, most of which belong to the lower ranks of life, any official formality in the countries which they come from, and particularly the act of taking an oath, is regarded with such a feeling of inherent respect that it would undoubtedly exercise a restraining influence upon objectionable classes.

It is impossible confidently to predict the future of the Russian and Polish movement, but if the social pressure in Russia continues to increase there will arise a yet graver question concerning pauper emigration. It is a fact that already certain Russian provinces are almost depopulated of the peasantry. The hardships of the Huguenots in their epoch of persecution are in no small degree repeated to-day in the bitter experience of the Jewish race.

The chronic outcry against the foreigner breaks out in cycles in all nations. He was a stranger and they took him in, and in England it is raised in some unofficial quarters very loudly to-day against the Jews,

but not enough to modify the public policy, although the competition of Jewish labor in East London has invited the "sweating process," and very considerably endangered Gentile bread and butter in that previously somewhat impoverished section of London. At the Eritte Gun Works, in Germany, a threatened strike was avoided this year by the directors resolving to employ no further foreign labor. But the Pacific invasion of the foreigner has been the most extensive in Switzerland of any country in Europe. There are now settled in Switzerland 238,313 foreigners. That is to say, 10 per cent. of the settled population of Switzerland are not Swiss. In the city of Basle 34 per cent. of the population are foreigners; in Geneva, 38 per cent. Switzerland enjoys the foreigner who comes to board and lodge, but the foreigner who comes to stay and compete is less welcome.

There is so much regulation in this world that fails to regulate, that those most conversant with the laws of inertia and gravitation in the world of population as a rule are most conservative in the application of legal restrictions. A preliminary study of human nature, as well as of social conditions, is needful to understand the scientific relation of the incoming millions to the millions already citizens. The movement to keep the hereditary pauper and the criminal or the ex-criminal classes out of the land is too obviously a movement required for self-preservation. It is probable the present laws, already of some service, are capable of yet further improvement in this regard. The exclusion of contract laborers is rendered difficult by the ease with which the disingenuous contractor can change the place and yet keep the pain.

The number of the objectionable classes evoked by European civilization is enormous. In England and Wales alone there are nearly a million paupers and criminals—35,000 *habitual criminals* being reported at large in that small territory alone. Statistics almost equally menacing might be adduced from other parts of Europe, although on the Continent the statistics of political offenders are in some cases so confused with those of criminal offenses that the figures are a less definitive revelation of the status. Especially is this true of Russia.

It is true that where immigrants most swarm pauperism is most prevalent. Nearly half the pauper population of Massachusetts is of foreign birth. In New York the same proportion prevails. Yet there would be an enormous increase in the foreign-born pauper list in the United States but for the fact that heads of families are the advance guard who precede the family to prepare the way for independent support. Since 1883 about 1,000 paupers, contract laborers, and other classes whom our laws forbid have annually been returned to Europe by the ships which brought them.

Mr. John Jarrett, consul of the United States in Birmingham, under date of August 21, 1890, writes as follows concerning this subject:

Since I have been here I have been quietly investigating the subject, but thus far I have been unable to discover any movement in which the Government of this coun-

try is interested directly or indirectly, for the purpose of assisting persons emigrating to the United States.

There are, however, beyond a question several agencies in this country which are engaged in this work. The chief of these was, and I think is still at 7 Cheapside, London. These do their business by advertising vacancies in America for clerks, printers, and mechanics. Large numbers call at these offices, and make engagements through these agencies, and thus get to the United States.

I have been very much impressed with the fact that the greater portion of persons leaving this country for the United States, at least two-thirds of the various classes of laborers are assisted to get out there. The low wages paid provide no opportunities whereby they may get the means of going out there on their own resources. From whence then do these persons get this help? Several, no doubt, receive passes from their friends who are already in the United States. If some means could be adopted by which we could know how many passes are forwarded from our country—for nearly all the work people in our country, when they send for their friends, do so by passes, *i. e.*, prepaid passages—having an idea of this number, it strikes me, the task of assisted emigration from this side would be much simplified.

Who shall have the tramp, the idler, the criminal, the dynamiter, the dangerous classes, is now the momentous question. But another question more momentous is this—What country shall have the honor of preventing these classes? What country shall, through the instincts of justice imbedded in law, minimize those conditions of production and of reproduction which breed human vermin? This, which is the profoundest of studies in sociology, is for that reason the profoundest subject for the attention of parliamentary bodies and of governments in an epoch when a constantly increasing number of political questions are also sociological.

As a rule those countries which are producing the largest crops of thistles in the industrial and social fields are doing the least work in exterminating and in preventing the multiplication of nuisances which are in the air and which, flying across the seas, defying national frontiers, involve alike in present dilemma both those nations which are promoting injustice and those that are in quest of equity. At present, it may be said, most nations are more exercised in dumping their paupers and criminals on their neighbors than in bringing moral and intellectual solvents to the causes which are behind social disorder, the unjust distribution of wealth and pauperism, and crime preventable by social readjustment and legislative reform. The problem is complicated by the haste of neighborhoods to be rid of moral and industrial lepers, who, are treated pretty much as physical lepers were treated in the Middle Ages.

The first thought of those concerned in the West End scandals in London, was to send the microbes to the United States, as the evidence adduced in the case revealed. But England is more sinned against than sinning. Of the 100,000 paupers in London, I am sure an enormous proportion have been swept out of the back doors of continental Europe. But brooms do not disinfect. The modern Hercules does not cleanse the Augean stable by sweeping the offal into his neighbor's lawn. Last year the London Thieves' Mission "sent abroad" 184 jail birds—ex-

convicts, whom it is desired to start in life under happier auspices—a humanitarian enterprise worthy all praise, especially if pains is taken to reproduce this composite picture in some other world than the New World. But there are evidences that not a few ex-convicts find their way to the United States.

I do not believe, however, that any European Government participates directly in this movement. There are few fields, however, in which selfish benevolence is working more mischief than in the deportation of objectionable contingents of population. A true internationalism must make important strides before the moral bacilli shall be rendered harmless by inoculation at home rather than by exportation abroad. The remedy for the industrial evils which are a cause of undesirable population involves personal self-denial and a degree of absolute fraternity, which are harder to embody than to admire. The exportation of incompetents furnishes an easy substitute for the slower enterprise of removing such causes as lie at other doors than at the door of the incompetent himself.

Should the immigration of 1890 exceed that of 1889, as is now probable, we have to contemplate certain new proportions, an increase in the transoceanic journey of the undesirable southern races and also of the comparatively undesirable races of northern-central Europe—I say undesirable, but perhaps it were justice to say less desirable. But it does not seem to me that even these races are undesirable absolutely, but only such factors thereof as form an hereditary line of paupers, and in my judgment these factors are much smaller than is commonly supposed. The Irish movement declined and the German movement increased in the last decade, but there are causes slowly operating to reverse these conditions, although causes now unforeseen render prophecy precarious.

If the rising ethnic factors are Teutonic as well as Latin, we ought not to be apprehensive of the general result. As a rule the forces of the human instinct are safer than the artifices of meddlesomeness.

What we want, perhaps one may be permitted to assume, is historical investigation of social development and the close examination of existing phenomena in race movements as the basis of legislation. As a recent English economist has well said:

> Much more might be done with our existing social machinery if those who guide it will but seek to understand of what it is easily capable.

The cautious extension of the functions of the state is the lesson of contemporary interference, especially as seen in Germany.

Where most races mingle there is most power. We all are emigrants either of some generation or of other degeneration. Foreigners helped us to American independence. An assimilative power is the modern instance in favor of unhindered immigration. Though we have been at work fusing instead of confusing races, but for a few generations—having paid the price of servile labor by civil war—we have reached a degree of race-harmony that in Europe many centuries have failed to

secure. There is more harmony between the Northern and Southern States than there is between England and Ireland, and the jealousy of Prussia on the part of the smaller and southern German states reproduces the dogmas of State Rights among the Teutons in Fatherland. A state whose chief aim is to prevent revolution will cripple evolution.

The lesson for the United States, it would seem, is to steer between the extremes of let-nothing-alone and of let-everything alone. Is it not true that the nation most pronounced in *laissez faire* is already showing symptoms of excessive haste in the opposite direction in certain phases of its industrial and internal life?

It is a great mistake to confound temporary or local phases of human character with human nature. We must have faith in the wonderful pliability of the human mind. The world, especially the New World, will produce men and women of different type from ourselves, of different type from any existing European type, and our strongest assurance of an evolution in the type lies in immigration. The waves of foreign prejudice which occasionally roll through our country covet hasty, sweeping, and illy digested legislation to restrict or restrain immigration. The country is to be congratulated that Congressional legislation continues to recognize the value of a good foreigner to the United States.

LABOR AND IMMIGRATION.

The industrial results of immigration often are misconceived just as the industrial results of new inventions often are misinterpreted. It does not do to view results from the immediate vicinity and time. When immigration flows into a country employers may compete less keenly for labor because there is more labor; but another result is the expansion of plant, the increase of consumption, and a larger aggregate share of labor out of the wages and profit fund. As you open the land, you increase the country's wealth, and eventually wages must be improved in that degree. No country more strikingly than the United States proves the fact that wages depend on the efficiency of work more than on any other single cause. The fact is that the consequent increased production in all trades increase the purchasing power of all, so that in the absence of other causes, like those of dishonesty, wild speculation, and gambling, the result is increased consumption.

It is astonishing to see how rapidly Italians of the new generation become meat eaters in America who in Italy lived on the sweet pods left over by the prodigal son and on the pork of a yet farther land.

American working men are alert to see the apparent inconsistency of protection to American industry which protects what the worker produces but invites new European millions free to compete with him; but many of these observers overlook the fact that Nature herself protects the man not only in the respects already adduced, but in virtue of the in-

trinsic expense and difficulty of moving man; for economists agree that of all "commodities" (not to use the word derogatively) man is the hardest to move. Not until hunger and hardship have become extreme will men forsake all that they have to seek a land to whose institutions, manners, customs, and language they are alien.

Nationality is more intense in France, Germany, and in Italy than in the United States. There is a tax of nature on the emigrant which he can not evade. The rupture of home, neighborhood, family ties, and all that, expressed in homesickness, is a tremendous head tax which Divine Providence imposes on the hearts of emigrants. An hour in the steerage of a crowded ocean steamship just pushing out into the Atlantic ferry from Hamburg or Naples will easily satisfy the skeptic who fancies that God has forgotten to protect or that man has neglected to regard the wages factor of the profit and wages fund of American labor. And it should not be forgotten that while young men in the Eastern States of our country easily emigrate in harmony with Horace Greeley's overworked advice, the young men and families of Europe find the sea a greater barrier to a new country than we in the United States find corresponding distances by land; for this is all our country, while in the European case it is not theirs. It is harder for a European peasant to raise $50 to get himself into the New World than it is for an American youth to raise five to ten times that sum. The fact that in the midst of enormous immigration wages in the United States continue to be as they have so long been, 40 to 60 per cent. higher than in Europe, is a practical answer to him who thinks American labor is not the best protected of the protected "commodities," if you choose to give labor that unscientific classification.

THE NIGHTMARE OF ANARCHY.

The law is, if you want an evil, fear it. Timidity and fear of open debate are the intellectual bacilli of anarchy. A government which fears its toilers, turns them into loiterers. An anarchist is developed out of a Socialist by iron and blood unmixed with justice in the government. Just as German Socialists were beginning to develop into anarchists, the young Kaiser, with right insight, interpreted the popular judgment as recorded in the elections for the Reichstag, and turned his attention to the labor question. The French have 15,000 foreigners, chiefly in Paris, of whom they they want to be rid, and we have a small contingent of similar quality in New York and Chicago. Our policy is the right one—to give them free course to "sweat with their mouths," but to show no quarter to assassins and murderers who endeavor to pose as political idealists.

Every great city has its centers of danger on which social revolutionists to-day are operating. John Burns to-day is listening to the ravings of Louise Michel in the Socialist headquarters in London; but

London smiles and her stormings are not dignified by martyrdom. In St. Petersburg and in all Russia the governed hold the governors in a state of siege. And to add to the grotesqueness of the situation the European Governments fill the streets of their cities with armed soldiers with extra ammunition on the day on which the working men celebrate the holiday of labor. The worst anarchists are women.

To remove the causes which are the apologetics of Socialism before they have become active is far wiser for our Republic than to attempt any aggrandizing of Socialism in America by suppressing its freedom either of speech or of movement. The attempt to weed the anarchic contingent out of the steerage or second cabin of ships sailing from Europe to ports in the United States is nowhere proposed. The half-educated foreigner, whose little learning is a more dangerous thing in this period than in any preceding transition epoch of history, will make his informed ignorance dangerous chiefly to himself, in the absence of Bismarckian or Russian repression. The social and political condition of London on Labor Day or anarchists' Sunday compared with that of St. Petersburg, Berlin, Paris, Milan, or Rome, is a complete justification of the Anglo-Saxon policy of freedom of emigration.

The Czar's indigestion, the Pope's allocution, the Kaiser's rescript, the strikes in Rome, the mutinies of unskilled labor in London and in Southampton, the poor harvests of Kansas or of Russia and Italy and Germany and even of India, the socialist propaganda, a war and rumor of war, the movement of an army corps on the Russian frontier or on the Italian border, the vote of the Reichstag on the budget or of the Congress of the United States on silver, all these and unmentioned multitudes of other causes promote or diminish emigration. The solidarity of the race is the irresistible tendency of an age of steam and printing presses. It is the wisdom of business in national as in individual life to direct its progress in harmony with forces that can not be extinguished and which may be correlated with movements progressive or retrogressive, according as wisdom or unwisdom regulates or dislocates the world of legislation, society, and industry.

We may deplore, as the Germans do, the chronic discontent, the illy-regulated unrest of modern populations; especially suburban and rural populations; but Jeremiah is not the prophet we require. Ruskin sneers at the materialistic tendencies, as do most of those who live among pure ideas; but deeper than the surface, which is restless, are the pure circulations which this restlessness is constantly aërating. "Our two objects in life," says Ruskin, "are, whatever we have, to get more; and wherever we are, to go somewhere else." But Ruskin overlooks the fact that the ideal society which his sneer would project upon the world is oriental. Better an hour of Boston, New York, or Chicago than a cycle of Cathay, absolutely contented, and never seeing any horizon but that within which one's cradle was rocked. Seven hundred persons a day leave Great Britain in quest of fortune. One hardly needs pre-

dict what Great Britain would become under the operation of that oriental and untraveled contentment which is the halo of Ruskin's social dreams.

In whatever respects the close of the nineteenth century is an im-improvement over the close of the eighteenth century (not to go back a century or two earlier), we must look for the controlling motives of all the political, social, and industrial and moral improvement to the inherent unrest and ambition of western European races. That at Plymouth Rock was initial of which our present annual average of half a million pilgrims is a sequence. Queenstown, Liverpool, Glasgow, Antwerp, Bremen, Hamburg, Havre, Marseilles, Genoa, Naples are the fruit of seeds planted at Plymouth and Leyden. In place of Parson Robinson we have Carl Marx; in place of Roger Williams we have Lasalle. But the sense of justice, liberty, political and social progress to-day is as closely allied to instinctive ambitious and discon-ents on the side of material progress as it was when the Pilgrims planted their first patch of Indian corn in the perilous soil of Samoset, who, by the way, was the first American reformer of whom American history speaks.

As within a month after the epidemic of influenza started in Russia in the close of the year 1889, that strange epidemic had crossed the continents and the seas, counting its victims by the thousand and the hundred thousand from the Neva to the Mississippi, from the Tiber to the Thames, so in the social and industrial life what at first appears to be sporadic becomes epidemic on electric wings. There is force, such as never began to be acknowledged in the eighteenth century, to the cosmopolitan tendencies—" a blow to one is a blow to all." Bane and blessing belt the globe. The cable is repaired almost as soon as it is broken. Russia's poverty produces Whitechapel in London, and the publican and sinner on Italian estates evokes Mulberry street in New York. Even "the dear old devil" is not quite what he used to be. Change is not only imminent, but immanent. It is not that we are sorry that we are here, but that we *are* here. And Ruskin is not our prophet. He only controls nature who guides her forces and conforms to her laws.

To overlook popular opinion and the public mind has been the chief fault of economic science and the chief characteristic of tentative legislation; but the method which is successful in physical science fails in economic and moral science. The forgotten factor of the new era of solid, logical legislation is the solidarity of the race, the modern expression of social, political, and economic progress. "The belief that a change ought to occur and will occur tends to make it occur." Socialism itself is the effect, not the cause, of modern discontent. The African who came to us against his will never was an immigrant. We are to blame for his being here. The Italian who comes to us of his

own free will is an immigrant, and if anybody is to blame, he is to blame. The question now is whether the forces of current discontent are not Providentially moving to free and acclimated settlements of European races amid agriculture hitherto largely under the manipulation of an abused and hence unwilling equatorial race.

There have been many solutions of the Southern question which failed to solve it, but the solvent factor surely is time, and it may be time working on material stranded on the Appenines in the fall of the eastern empire of Constantine. It is only that nation which is dominated by blood and iron which need fear iron in the blood. Only that government which is based on justice and administered in equity will surely be exempt from the nightmare of anarchy.

THE FOREIGNER IN AMERICAN CITIES.

The prodigious growth of American cities is the intellectual as well as industrial phenomenon of the last decade of the nineteenth century. In cities we distance all civilization, both eastern and western. We have, or ere the twentieth century shall have a dozen cities having a million and upwards of population. Of the thousands of emigrants who land daily in New York, it is probable that 33 per cent. become permanent dwellers in our cities. On a railway emigrant train from New York a canvass was made, showing among the passengers the following: Americans, Germans, Dutch, Italians, Scotch, English, French, and Chinese of whom upwards of 50 per cent. were going to various cities.

American cities, both the provincial and small and the commercial and large, to-day are in a certain sense foreign cities. Every language under the sun is spoken in them, and there is "a quarter" where each nationality predominates. This is also true of Berlin, London, Paris, and other European cities; but in American cities this characteristic is universal, obtrusive and hence more pregnant with industrial, social, and political consequences. Cities are more than depots of trade. Cities generate intellectual, and the country generates moral force. It is as necessary to have centers of thought and of distribution as to have areas of ethical power and production. The man who made the New World a fact of consciousness instead of a dream of the imagination, was born in a city, but the founders of New England civilization were rustics. Columbus was an Italian, born in Genoa, but Brewster and Bradford and the whole body of founders of the civilization of the New World were born and bred in the country. Washington was a gentleman, but a country-gentleman, and Lincoln moved out of a cabin into the White House.

Moral forces in politics are country bred, as a rule. Cities promote political progress, so far as that progress depends on the intellectual forces; but cities dwarf enthusiasm, self-sacrifice, reverence and chastity, while they promote the charitable and industrial virtues. The city is less social than the country; in the country an Irishman and a Yankee owning adjacent farms necessarily become sociable. In cities dwellers on different flats of the same house are unknown to each other. The country hastens the amalgamation of races; the city tends to luxury and physical decay. The conditions that are favorable to intellectual growth usually are unfavorable to moral development. Cities repress crime but encourage vice. The country supplies fewer safeguards against crime but it discourages vice.

It has been well said that the morals of men are more governed by their pursuits than by their opinions. Cities are the bane and the blessing of the State. A purely agricultural country would be stagnant. The city and the country are respectively the antidote for the bane, the one of the other. For the safety of States there must be healthful coördination of urban and rural life, a proportion, point and counterpoint in rhythm of population. Are not some of the clews to a better proportion in American life, to a diminished alien congestion in cities, furnished in the suburban movements of Italians and in the tendency to garden farming and other small agricultural enterprise illustrated by the Swedes and indeed to a considerable extent by the Irish, Scotch, and other immigrants who need informing and direction and who have been redeemed from cities where they were not needed, to the country where they were needed, by the enterprise of individuals who, instead of issuing jeremiads over the decline of American rural life and over the idle lands in States old and new, have started immigration to the land and opened up new agricultural colonies to make the city more indispensable by making the country more productive?

Cities are to-day as they were in the middle ages, the asylums of feudalized workingmen seeking better wages. The free cities of Germany and Holland saved industrial freedom. The function of cities continues in substance, though the form may change. By extending the suburban influences, the standard of living and supply, ease of communication, cheap transportation, the parcel post, postal savings banks, daily mails, libraries, schools, and other facilities, the city and country may be brought into better touch and rural life aggrandized.

One of the closest English students of emigration gives me the following views:

I would be cautious about interfering with the liberty of any individual who is not under the ban of the common law. If you want to prevent the free movement of populations seeking to better their conditions, you must go outside the common law. But I think Russia has no business to unload her undesirable population either upon Great Britain or upon the United States. I think it is possible that this question may become grave enough for diplomatic protest.

As to the congestion of population in cities, I believe it is less than is assumed.

The middleman exists because he is wanted. The Italian who sells matches, or grinds scissors on the streets would not be there did not his patronage prove that he is a public convenience to the extent of a public willingness to be taxed to keep him there. The crowds of vendors on the streets are more a convenience than a nuisance.

I think the present tendency to avoid the country and to flock to the city will continue as a dominant bias for the reason under the present conditions of life, the tendency is that fewer and fewer persons are needed to raise the same quantities of food, owing to better methods of farming and improved machinery. The moment there is a rush to land, that moment bread and meat become cheaper, and farming is now on the decline because it pays less than the average of other employments. Yet I know that were a general advance in wages to occur, so as to increase the purchasing power of the masses, there would be a vast increase of consumption of food as well as of other products. This would be especially true of meat and dairy products.

The prime reason why people seek the city is human nature. People find in the city happier conditions of life as a whole, the amusements which they need, the libraries and schools which they want, the chances for getting on in the world. I do not look regretfully on modern municipal life. I believe the evils of city life will gradually be corrected by time, and I am wary of legislative interference, while I agree that the evils of immigration might become so great in England as to call for legislative interference, but I am in no hurry. Data for legislative interference are yet wanting. I would not legislate to keep a bare-footed, ragged, or even drunken immigrant from landing in England. Not that I might not perceive certain evil results, but that I am very chary of restricting the absolute freedom of English soil. I can perceive, however, that this Jewish movement into England might become such a menace to our country as to render interference necessary, but I do not see that such a time has yet arrived. There is small doubt that in this matter Russia is already violating the comity of nations.

It is a common mistake to suppose there is in Great Britain a considerable army of unemployed. But, the fact is, only 1 per cent. of our population is idle in cycles when business is good, and not over 5 per cent. in periods when business is poor. The tendency to cities is a sign of evolving social tendencies. The advantages of civilization are wanted, and large cities prove the good results of the increase of product from the land as compared with the labor-power expended. The multiplication and increased population of cities is a declaration that there is an increase of human leisure for the mind of man.

The principle at issue in the matter of regulating emigration is this: How many encroachments on personal liberty are advisable or permissable under the principle of the greatest good to the greatest number? Shall all die for one? Certainly not. Shall one die for all? If so, how many of the minority must we sacrifice for the majority?

The newspapers of England during the past season have been speaking of the 320,000 of annual gain in the United Kingdom in spite of colonization and emigration, and in the issues in which their congestion of population is spoken of paragraphs like the following may be found.

Kentish farmers are commenting somewhat anxiously on the scarcity of labor. The crops must soon be got in, but there is no sign this year of the usual swarm of casual laborers seeking work in the harvest fields. A disengaged laborer promises to be as scarce in the country as an unoccupied lodging-house at the seaside.

In other words, despite the density of population in Great Britain, there is the same complaint which is made in Germany, only less emphatic, of the difficulty not only of holding the old workers, but of securing new agricultural laborers. English students of this phenome-

non argue that this difficulty arises not out of any perversity in human nature, but because the average condition of the wage-workers, even in the most congested districts of English cities, is better than that of the agricultural employé. And this statement, no doubt, has much of the force of truth, because hours are longer, wages smaller, and the intellectual opportunities and physical relaxations are fewer in the country than in the city.

The hardships of metropolitan life in Europe are, however, considerable. In summer nights thousands of homeless persons make their beds in the parks, on the seats of Victoria Embankment, and in the dark nooks in and around Covent Garden. Every recess on Waterloo and Blackfriar bridges is an involuntary bedroom under the canopy of fog and drizzle, despite the enormous energies of benevolent institutions and private charities. The special investigations of the parliamentary committee on the emigration and immigration of foreigners states that in 1889 there was a check on the immigration of destitute foreigners to London; but if I am not misinterpreting the statistics of 1890, the influx of the past year has been much larger than for the year preceding. Of the foreigners who enter England and Scotland at ports north of London, all but a mere handful pass on to the United States, while of those who come to London from the Continent a large majority remain in the country, choosing London especially. Into the Thames, in all sorts of craft, the continental races swarm, and a night in the east end of London is the most striking illustration of the evils of pauper immigration which the world affords.

It is estimated by a recent writer that in 1888 less than half our population were descendants of the original white colonists. Our American cities are singularly cosmopolitan in this respect, more foreign in population than many that are foreign in location. A day in New York, Philadelphia, Pittsburg, or even Holyoke or Lowell, is a day in Naples, Genoa, Paris, Berlin, St. Petersburg, Copenhagen, London, or even Jerusalem or Canton. One may girdle the globe without Puck. The Ghetto at Rome has disappeared, but you may find it in the Hebrew quarters, not only of London and Manchester, but also of New York and Chicago. The majority of immigrants land and stay a while at least in the Middle States, but in the end many of them find the West—the vague continental spaces yet open for the poor and cast down. But certain races have an ineradicable preference for towns.

One who has studied the Irish peasantry and observed their love of land in Ireland, wonders at their dislike of the American farm. The Irish in the United States are a metropolitan race. The Germans are fond of cities, but they take to the land more kindly than the Irish peasantry. The English choose New England, but its manufacturing cities. Only the Scandinavians have a decided bias at the very outset for the hill farms of New England or the fields of Minnesota. There are manufacturing cities from Maine to Illinois whose native population

is not 25 per cent. of its foreign population. The French Canadians and the Irish form upwards of 50 per cent. of the population of several manufacturing cities in Maine. The Yankee, at the present rate of change and assimilation, will soon have to put himself in a glass case to preserve his identity.

Fall River, Mass., has but 17 per cent. of native-born citizens, and Holyoke, in the same State, only 16 per cent. Many New England cities are constituted 45 per cent. Irish; others, 30 per cent. Scotch and English; others, yet, 60 per cent. Italian. Boston, Lowell, Lawrence are no less foreign than New York, Pittsburg, and Buffalo. There is no doubt that the problem of municipal government is greatly complicated by the presence of this indigestible illiteracy and of this provincial and alien mass which more than once has shaped not only metropolitan, but State and national government. It is only by strenuous loyalty to civic education and the common school that results yet more serious can be avoided. It should be considered, however, that the intellectual discipline of new population proceeds much more rapidly in city than it could proceed in the country, and that the problem in cities is as much the preservation or upbuilding of civic virtue as the decline and fall of illiteracy.

Of our foreign population about 30 per cent. is now illiterate—the ratio being increased especially by the Italian movement; but attention is again called to the fact that compulsory education in nearly all of Europe will soon materially improve the statistics of emigration in regard to illiteracy.

The American farmer is now our native-born citizen *par excellence.* While our cities are controlled, as a rule, by foreigners, or, if not controlled, overpopulated by foreigners, of the probable million of farmers in our country only about 100,000 are foreign. While foreigners form at least half of our manufacturing population, they form but 10 per cent. of our agricultural population.

THE EMIGRATING WOMAN.

While some of the new States, Territories, and communities of the United States are advertising in Europe to pay a premium for women emigrants and putting a special tax on bachelors and bestowing special privileges on benedicts, family life in cities is declining, divorces are multiplying, and club life is organizing as a substitute for family life. On the continent of Europe woman is the overlooked factor of political life as well as of intellectual and social progress. The increasing proportion of young women in the steerage of emigrant ships is due to causes more involved and numerous than the motives of male emigration. In the steerage of a steam-ship about to sail to New York from Glasgow I saw at least a hundred young women, nine-tenths of whom

were going to the less populous parts of the United States, some to the farm-houses of friends in our distant Territories.

In treating of French emigration by the way of Canada, striking peculiarities of the race movements were noted. The English who come to this country via the English colonies number not a few. There is an incipient movement from Australia to the United States; but the movement from the Dominion of Canada, and especially from New Brunswick, Nova Scotia, and Prince Edward Island is quite large. Last year 38,989 of the "flitting bluenoses" entered the United States from points east of Vanceboro', while but 20,369 returned. These figures do not include the large incoming by sea. Thousands of girls seeking employment as house servants enter the United States from the far northeast of our continent.

In four months of last year about 3,500 persons emigrated from Prince Edward Island to the United States. Of course this emigration is far more transient than the transatlantic movement, as is shown by the almost imperceptible number of children coming in from the provinces; but the fact is that during the busy season of the year an enormous amount of industrial power has come from that source into New England. Add to this the contingent of English-speaking immigrants that come via Island Pond, and the total figures rise to nearly 50,000 English, or, including French-Canadian, to nearly 70,000 all told. The percentage of women in this emigrant list is only less than the percentage in the Irish movement. A phenomenon of the present emigratory movement is the increase of the swarm of young women to the country which is singularly adapted by its sense of fair play to woman to give her an independent career.

COLONIZATION AND EMIGRATION.

Statistics of emigration taken alone do not convey with adequate force the enormous presumption which exists in the minds of European masses in favor of the institution and industrial and social and religious advantages of the United States. I have already indicated the tremendous activity of German official and semi-official circles in the promotion of colonization, especially in Africa, and the feeble stream which this agency succeeds in forcing uphill. But if the Germans are sometimes fruitlessly active in their zeal for colonization the English are scientific, tireless, systematic, thoroughly organized, as long practice and prodigious success in colonization naturally would imply.

The literature of current and projected English colonization is enormous. The mother country is flooded with posters, circulars, prospectuses, pamphlets, volumes whose object is to convince the English-speaking races of the home country that both self-interest and patriotism, the welfare of the wage-worker and of the manufacturer, of the

shopkeeper and of the jobber lies in encouraging the industrial exploitation of the colonies. Quick and cheap passages to Australia, New Zealand, Manitoba, special favors to settlers and other enticements are laid before the people. Yet in spite of all the Canaan of the mother country is the child that cut the apron strings only a little over a century ago. And the especially noteworthy feature of the English colonial policy is the somewhat obtrusive spirit of independence in the colonies, which, in some quarters, is interpreted as anti-English, both from the point of view of nationality and of trade.

The English in England say that every pipeful of their tobacco is now helping to pay for land that is as much advantage to the trade of other lands as to itself. The fact is that in our generation colonization from a purely selfish point of view is exasperating in the ratio that it is successful. In a purely humanitarian aspect the picture is more pleasing; but people in a singularly commercial age and spirit object to any scheme that, even at the bowl of a pipe, is exclusively confined to showing that it is more blessed to give than to receive. With the rubbish of other lands pouring into an already congested labor market, Great Britain to-day is uneasy over the increasing difficulties and menacing questions of colonization, and not a few of her people are crying out for restrictions on pauper immigration and for a better occupation of the land of the kingdom itself. It would be an interesting phenomenon of changing opinion if England should begin with a protective system where America stops.

But the great lesson which English emigration statistics and colonization histories has for the United States is this, the practically unlimited potential of the home trade of the United States under the beneficent expansions of agriculture and manufactures, country and city, production and consumption, resultant from thoroughly colonizing and populating the home farm. Under a homogeneous federation a union of hands becomes a union of hearts. To populate first and then to federate is difficult, as England perceives at arms' lengths in several senses. Federation in this country preceded population. This is the most powerful of reasons for the great stream of emigration now coming to us. At the same time this is one of the most urgent of reasons for encouraging it. *En passant* one might add that Russia is to-day opposing British dominion in Africa, favoring German colonization there as a counterpoise to that of Great Britain in the Orient, and because a German outlet in Africa means an easy vent for superfluous population that swarms into the western Russian provinces to the detriment and danger of the Czar.

Civilization in the year 1890 has been very active on paper, that is, the agitation in its favor was never more pronounced in Europe. Prince Hohenlohe is at the head of a German syndicate for the purchase of immense tracts of land in the State of Chihuahua in Mexico, to be colonized by Germans. Chinese colonists are said to be preparing to occupy

a million and a half of acres purchased on the Isthmus of Tehuantepec. Austrian capitalists are making investigations in America with speculations in view, in some cases, and with colonization as a means of margins, in view in other cases. The efforts of the German foreign office to divert German emigration toward German colonization are elsewhere treated of.

GENERAL REMARKS.

The ferment of emigration accounts for great popular movements. The exodus led by Moses was fathered not only by ethical but by physical causes. Hunger was the eleventh commandment that got currency before the tenth. Abram was a foreigner developing the agricultural resources of a country much as the rangers of western cattle ranches are now doing, pastoral forerunners of an agricultural evolution. The colonies of Phœnicia and of Greece exemplify the rise of new societies out of domestic emigration, as clearly as the Dutch in Manhattan, the English in Massachusetts, or the French in New Orleans. When 6,000 hungry and gigantic Scandinavians with their families swore never to forsake each other and moved south, "God brought them to a vale in the Alps"—and the germs of Swiss nationality were planted amid self-denial as profound as that of the Plymouth colony. The emigrations of Germanic races reconstructed Europe.

The earlier movements of peoples were abetted by religious persecution, reënforcing the motive of hunger, but the revocation of the edict of Nantes showed how religious persecution fertilizes industrial evolution. The first traders were travelers. When the Queen of Sheba came to Solomon, she brought propitiatory presents. Her visit served her much as that of the peripatetic Italian to the United States serves him to-day. That oriental Yankee woman went back to the Dark Continent wiser than she was before, and she got more than she gave. Emigration which begins to travel and passes from transient into permanent characteristics, gives rise to commerce, to geography, to the expansion of all forms of human life. The Queen of Sheba left locusts and wild honey on becoming an emigrant just as the Italian gives up coarse bread and curd on becoming an American.

The United States is taking from Europe its best industrial power but is giving back to Europe an enlarged commerce. The exports from Naples to the United States have enormously increased since the Latin race began to swarm in America. It is the blessing of all races and all nations that Man is an emigrating animal. The provincial intellect which expends itself in hating foreigners is in the thick skull of prejudice, not under the large hat of social, political, industrial, or moral progress. The history of Spain is rich in suggestiveness. Despite the printing-press, the railway, and modern science, Spain is depopulated.

A splendid country that God made, man has spoilt. The prosperity of modern states is in the ratio of their toleration of Babel. By this test one may measure the great progress of the United Kingdom and of the United States as well as the stagnation of Russia, and the dilemmas of Germany. The nation that welcomes good men and women from afar, is rich because intelligent toilers add to national wealth and there is no limit yet in sight to the productiveness of land scientifically cultivated. Emigration is a barometer of two social conditions—it tells of the pressure of the social atmosphere in the country whence it comes and in the country whither it goes.

Races rise in virtue of physique, knowledge, and fidelity. The Dutch made the sands of Holland, discovered in the bed of the sea, into a fertile country, the most influential in the history of modern civilization, of any land and people, according to area and population. They founded our greatest American city as a holiday while slave labor was turning gardens into a wilderness in the Southern States of America. It was the Dutch emigrant that laid the foundations of English manufacturing and commercial thrift. Such is the power of uprightness, mutual confidence, technical skill, and a good body, in the rudest of climate, that makes at once for work and health.

Judged by this standard what is the industrial value of an Italian who is coming, in spite of us if not because of us, as compared with that of the African who came in his own despite and whom many, whose hereditary ideas forced the issue on America, now heartily wish to be rid of? Employers of African labor often reply for that matter. The employers of Italian labor, as elsewhere cited, speak highly of the fidelity and physique if they can not of the knowledge of such samples of Latin industry as have come to these shores.

By the same test it is likely that Americans would more highly esteem the German than the French, while unquestionably highest in rank of fidelity if not highest in rank of knowledge, the Scotch and English emigrant probably would be placed. And also in their favor is their community of language and of origin. The Celtic stock probably assimilates as readily as the Teutonic. The Irish immigrant of the second and third generations loses his Celtic individuality in a degree. If in thrift and knowledge the Irish are inferior to the English, Scotch, and Germans, their influence on the domestic virtues in the United States, on family chastity and unity in particular, has been most favorable.

There is no doubt that socially, industrially, physically, and even morally, each of the four great emigrating races are doing this country, as a whole, a great service. In other words the evils of emigration under the existing restrictions are small as compared with the blessings which immigration confers on the body, mind, heart, and future career of Americans. The process of natural selection never had such full swing among human population.

The emigration statistics of the United States published since the year 1890 opened, have amazed European governments. The fact that since 1820 Europe has sent upwards of 15,000,000 of people to the United States to develop the resources of the Republic, is impressive especially in Great Britain which has lost 6,000,000, in Germany which has lost upwards of 4,500,000, and in Ireland which has lost 3,500,000. To the continental races the spread of the English tongue is not the least significant consequence of this immense movement of races.

Since the opening of the present century English has advanced from 21,000,000 to 125,000,000 speakers—that is, from 13 to 31 per cent.—largely through emigration to the United States. English is now spoken by nearly twice as many people as any of the other tongues of Europe and its relative growth shows no signs of diminution. English has preëmpted the North American continent, where there are to-day twice as many speakers of English as there are of French in Europe. The English language also occupies Australia, Great Britain and Ireland, while in South Africa and India it menaces all other tongues. In fact, English is now the speech of the world of travel and of trade.

1 The feature of immigration most to be emphasized, is not its evils, which are few compared with its blessings which no man can number, blessings singularly such as are needed in a new country which yet remains so largely in a state of nature for the want of industrial power. Apart from the inclement season, which is the prohibitory act of nature on out-of-door operations whether in internal improvement or in agriculture, unskilled labor in the United States is yet in great request. The scarcity is notable in the busy seasons of the year, while at all seasons of the year the kitchen, the laundry, and the house in general call in vain for cooks, scrubbers, and chambermaids.

2 The nation which wants the foreigner least, to-day is least wanted of steam, invention, and social and political progress. The rise of prejudice is the fall of industry.

The movements of races in the dawn of history were politico-economic; the corresponding movements at the close of the nineteenth century are economic-political—that is, the economic factor is now foremost. We have seen the operation of the political factor, however, in the Semitic exodus from Russia and the politico-economic in the Irish movement; but the vaster movements, like those of the Teutonic, Latin, and English races, are predominantly economic.

We need, accordingly, to keep as predominantly in mind that the necessary result of these facts is that the United States, as a rule, gets the hardiest and most select of the masses of European populations.

As a rule, among existing conditions, the most enterprising yet constitute the great body of emigration. We must not wonder, then, at the prominence which the word "enterprise" enjoys in the American industrial vocabulary. Emigration to-day as clearly as ever deprives a country of industrial power, and immigration adds to the wealth of the

land that enjoys it. I advisedly say enjoys it; for the deeper the race antagonisms within a country, the more surely will blessing turn to bane. To encourage immigration and education together is to insure prosperity.

There are about 600,000,000 of square yards in the earth's surface; yet one statistician figures that at the present rate of increase of population in England there would not be standing room on the globe in A. D 3,000; but England is the world's way station, and there are evidences that nature cares for her own by the limitation of families and by the almost boundless expansion of the productive capacity of land. Dear bread means less wedlock, while rise in incomes means more families if not larger families. Stock quotations and honeymoons are coördinated.

But capital and labor are not of infinite power. They can not enlarge the world's area, though they can prodigiously multiply its productive power. The endowment of air and sun may be slightly modified by man, but their aggregate is beyond man's reach. There are said to be 1,450,000,000 of people in the world of whom probably less than 10 per cent. are in the New World.

While, then, the globe easily could support ten times the population 1
it ever has had, yet, of course, there is a limit to production under the law of diminishing return. After population had reached a certain density, a time might come when additional outlay would not raise a proportionately increased amount of food, and while we never have had a period in history when means of possible subsistence at all lagged behind population, it is easily conceivable that the decline of war, the improvement of sanitation and science, as well as sound ethics applied to social life, might end in hunger. Fortunately, the easiest way to solve such problems is not to solve them, for they are not likely to become urgent for thirty centuries yet to come, and no doubt the patriarchs of that next Pentateuch will be able to build their own bridges and look out for Pharaohs not now in sight, and to manage their own Red Seas not now a menace. It is enough to say, that on this side of the sea, and at the close of the nineteenth century, a craze against foreign immigration would be irrational, suicidal, anti-American, anti-republican; but all this may be true amid the enforcement of obligations imposed by a first principle of self preservation. We want in our veins more good blood, while we must beware of poison which might involve all in common disaster.

APPENDIX.

GERMAN OFFICIAL VIEWS ON COLONIAL AND ON AMERICAN IMMIGRATION.

The following is translated from a paper recently established by the German foreign office in the interests of colonial emigration, and is here reproduced as showing something of the sentiment now prevailing in Germany relative to emigration and colonization:

The difficult problem of German colonial politics is no nearer solution. Why does Government not govern German emigration from the standpoint of the people so the people might think that the Government ought to care for its colonies and increase opportunities of trade, and watch for the coöperation for this department of emigration? But one must consider that the home opportunities are not absorbed. Private parties at home are fond of Government aid. We need, however, fuller statistics about the callings of emigrants. We also want the reasons of emigration, the goal, and home of emigrants. Out of these facts we could find causes of emigration. Now the gate and door stand open to every objection. We need to know what becomes of our people and how they fare when they emigrate. Many emigrants look very unfairly on their future in Germany, and deceive themselves, and long for strange homes, and underrate the value of their old position in Fatherland. Statistics ought to make our people more content by showing the frequency of failures abroad. We need to remake agents' affairs, and through good colonization will the realm be able to correct the status. In general, capital and work together, are strong in transatlantic enterprise, because there the Government, growing and protecting, stands aside. The need and utility of colonization are clear. The now-existing German colonization companies, however, fail for want of capital. In South America interest is from 20 to 30 per cent., and German capital is easily diverted. In no undertaking is gold a more ethical force than when it coöperates to call sound colonization into life.

The cause of German emigration is relative overpopulation. Either improved conditions of existence or greater economy at home is necessary. The growing knowledge, ability, and capital of Fatherland should not be lost to Fatherland, and when these go hence they should not be separated in interest from Fatherland. Our emigrants go to America, Australia, and other countries. The competition in the industrial districts, the pressure in the higher callings, our one-sided culture, and the smallness of our territory are elements to be taken into account. According to Dr. Fabri, it is the struggle for existence which occasions mass emigration, and emigration is strongest where wages are lowest, and where the wages of the rural population are such that the workers can not create a home of their own. Knowledge and ability seek expression. The extension of our territory might insure for our people a normal development. Emigration is the natural result of the increase of population in a country whose land and industry offer for this increase unsatisfactory opportunity and reward. It is like the overflow of a filled cistern. There is emigration voluntary and arbitrary, the necessary result of recent economic development. The continued overpopulation of European lands kindles a desire for the extension of domestic territory directly at the frontier, but there is a necessity of seeking this extension in

distant places. Besides, there is an anxiety of small proprietors that their children and relatives may not fall into the proletriæ.

German specialists agree that German emigration is an historical fact, and that it must be explained from history. In view of the equal growth of all callings and trades, the cry goes forth from all workers as well as from the landed proprietors and well-to-do callings. It is difficult for the wage-worker to get good wages on the one hand, while on the other hand the land-owner struggles to hold his own. A German company in Baltimore reports that it is amazing what masses of young educated men come here without knowledge of English, thinking that immediately they will have a good position on account of their knowledge. Their illusions are not realized. Some few succeed to good positions; others send home for passage money to return to Germany; others go to farms; and some turn to tramps.

Of Germans emigrating to the United States, all callings give their contingent, as is illustrated by the following statistics from the census. According to the census of 1880, Germans in the United States represented callings as follows:

Farmers	240,000	Liquor sellers	20,200	Glass makers	1,500
Land laborers	50,000	Traders	11,000	Gold and silver workers	3,000
Gardeners	88,000	Shoe drummers	1,700	Smiths	2,200
Small farmers	1,500	Tobacconists	2,600	———	4,400
Herdsmen	580	Clothing traders	3,000	Bat makers	1,300
Cattle raisers	400	Apothecaries	1,100	Workmen in iron and steel	9,000
———	7,000	Traders in small wares	6,000	Carvers	1,000
Restaurant keepers	1,200	Colonial ware traders	17,000	Machinists	8,000
Clergymen	4,200	Wine and spirit traders	3,200	Manufacturers	5,200
Servants	64,000	Grocers	38,000	Stone cutters	3,000
Eating house keepers	5,000	Real estate agents	600	Masons	1,200
Hotel landlords	4,000	A long list of hand work and miners		Dress makers	9,000
Laundry proprietors	5,000	Bakers	14,000	Millers	3,500
Lawyers	750	———	15,000	Painters and sculptors	10,000
Musicians	4,000	Bookbinders	1,100	Instrument makers	1,600
Officers	2,700	Beer brewers	10,000	Lead workers	800
Doctors	2,550	Shoemakers	28,000	Printers and lithographers	3,500
Beer gardens	2,400	Brick workers	3,000	Stone breakers	760
Teachers	4,500	Butchers	80,000	Saw mill workers	5,000
Agents	1,000	Contractors	600	Ship carpenters	600
Bankers	800	Cabinet makers	12,000	Soap makers	1,400
Book-keepers	3,200	Carpenters	30,000	Ship boiler makers	750
Clerks	17,500	Cigar makers	12,000	Men and women tailors	37,000
Drummers	1,600	Watch makers	1,700	Knife makers	1,500
Teamsters	13,000	Sweet bakers	2,700	Wheel makers	1,500
Railroad employés	10,000	Cooks	9,000	Turners	2,300
Interpreters	7,000	Cotton spinners	1,000	Wool spinners	3,500
Milk men	1,800	Manufacturing workers	3,000		
Railroad officials	2,700	Engineers and firemen	4,000		
Peddlers	3,100				
Sailors	2,100				
Small sellers, men and women	2,000				

Unfortunately the German Government has no survey of its own industrial population to be compared in value with this. To American statistics we are indebted for all the knowledge we have of the callings of emigrating Germans.

It is evident that in considering the subject of colonization we must look to all the

professions. A firm position in life is obviously better than an uncertain one. The pressure of overpopulation obviously is on all trades and callings, both official and private. There is a great pressure for life positions due to favorable conditions of men early in life. The German army has absorbed the influx of workers among the wealthy classes, but the learned officer and teacher wait very long for a position and yet longer for promotion. The higher aristocracy take the best places, and a lower official position pays little. Everywhere is dissatisfaction. How to provide for the surplus becomes very difficult, and the surplus population increases and the overpopulation is in all departments. So need and want follow. One must not overlook socialism. This tends to magnify the evils of society. It is easy to lay off the blame for the struggle for existence.

In New York cheap lodging-houses serve large numbers of needy young men with beds for 10 cents a night. Emigrants, penniless, repent too late of having emigrated and say, "I can't be worse off in the United States than I am in Germany. Why can't I succeed?"

So the emigrants stifle objections. But emigration to a strange land is far more difficult than it appears. Cultivated Germans, of whom you might expect better things, go the United States as well as others. The surgeon, officer, physician, economist, and spinner go, expecting to convert their knowledge into cash. The majority of these immigrants underrate the value of their places in Germany and overrate the value of places in the United States. In 1888 there emigrated from Germany to the United States 98,568 persons; from Bremen, 52,977; from Hamburg, 24,502. Eight and nine-tenths of this belonged to land and forest economy; other professions and trades, sixteen and seven-tenths; peasants and ——, 8 per cent.; unclassified, 16 per cent. Forty-two per cent. were members of families. The wage-workers and persons without callings show least. In the year 1888 probably 33,000 land-workers left Germany. From 1871 to 1880, inclusive, there emigrated to the United States 1,769,297 Germans. In this number there were not included many foreign ports, since to the United States, from 1871 to 1887, there went out of Germany 1,884,750 Germans. In this time Hanover, West Prussia, and Schleswig Holstein show most emigration. The land and forest lose an enormous contingent. For the evil of the emigration of our peasantry there is the remedy of keeping good the conditions of peasant life and giving satisfactory employment—making room for independence at home. If we want these persons to stay at home on a little we must make it as easy as we can for them. All who are not needed, the surplus, must emigrate. The expansive strength of our people will not be circumvented by law.

A satisfactory existence is not now assured in the Fatherland, hence the people thus affected must go elsewhere or the morbid tramp will frightfully increase. The state thus suffers badly from the loss of good citizens and steps should be taken for the increase of estate positions. Heath and moor cultivation in the east of Fatherland is increasing. Wrong relations exist between an increasing peasantry and a scarcity of land. High land rent prevents field farming and is a hindrance to the progress of the peasantry. Large estates are also a barrier. There is a pressure from all callings. Our territory of consumption is too small for our production, to say nothing of our ability to produce more.

From 1860 to 1871, if emigration had stood in direct relation to exportation the exportation from Germany would have been nine times as large as that of France. The exportations of England would have been from one-half to three-fourths greater than those from Germany, and yet the fact is they were really five and one-half times larger. Our most important problem is to convert into money our working strength in furthering colonization in strange lands in order that this productive strength may advance the consumption of agricultural products.

Professions and trades play a part in emigration as important as do land and forest. Beside overpopulation there are other causes of emigration. The chief motives of colonization have reference to four chief divisions of human life—family, property,

church, and State. All mass-appearances in history must be explained through the co-operation of the practical ideal. People doubt whether religion or belief has anything to do with emigration. The compulsory school, and the army, and State taxes and so on are among the causes which stimulate emigration from Fatherland. Socialistic and political dreams lead to emigration and form seductive enticements to the New World. They also lead those of healthier minds to be disgusted with Fatherland and hence to emigrate. In numerous cases emigrating Germans send money home for passage abroad, and Germans at home convert into money their own assets in order to emigrate. Through teaching and warning this should be overcome. We must have organic control and recognition of a free development.

First. German emigration is the expression of German affairs and ways in connection with German history and development.

Second. German emigration is caused in the main by overpopulation, whose surplus might be utilized by better distribution of lands and industry.

Third. German emigration is often due to self-deceit and false enticements. The home positions are underrated and the attractions of foreign lands are overestimated. Socialism helps this work. Every emigrant hopes for more independence. There is a want of organization in the German management of emigration. Since 1888 has transatlantic emigration existed and against all warning. In some cases it has been seen that the United States were ready to make it difficult for emigrants, and yet in spite of all efforts to divert the stream of emigration to the Latin races of South America, but a very small contingent now go to South America. Does Providence wish the best of our population to pour as emigrants into the United States? From 1871, not only Prussian and Suabian, but all districts have been drawn abroad carried on by the consciousness on the part of the emigrant that he was one of a great nation. From 1871 to 1888, inclusive, there emigrated out of Germany 1,769,297 persons. Of these there went to the United States 1,618,816. In the same time 4,780 emigrated to British North America, 33,443 to Brazil, 15,999 to other ports in South America, 16,841 to Australia, 4,047 to Africa, 108,000 to Asia. The American statistics are in fact even higher than the census of the United States would indicate, because many Germans go from England and other ports.

German immigration from 1871 to 1887 constituted over 28 per cent. of all immigration to the United States. In emigration the Germans are the strongest race. German emigration to the United States is exceeded by but 2 per cent. by the emigration of England, Ireland, and Scotland together. The immigration into the United States has already been given. From England and Wales in the same period it was 913,371; Ireland, 906,271; Sweden, 405,442; Italy, 346,706; Norway, 232,168; from the Eastern Empire, 211,174; Scotland, 187,121; Russia, exclusive of Finland, 154,864; France, 105,047.

Although the immigration statistics contain no explicit statement as to the part of the United States which is preferred by German immigrants, a picture of the distribution of the Germans in the United States may be obtained by a study of the census. The following figures give the distribution of Germans in America in the year 1880, but only in cases where more than ten thousand German immigrants have settled in a single State.

State.	Increase.	Decrease since 1870.	Entire population in general.	State.	Increase.	Decrease since 1870.	Entire population in general.
California	42,532	12,838	864,694	Michigan	89,085	24,942	1,636,937
Connecticut	15,627	3,184	622,700	Minnesota	66,592	25,228	780,773
Illinois	235,686	82,036	3,077,871	Missouri	106,806	68,182	168,380
Indiana	80,756	2,700	1,978,301	Nebraska	31,125	20,171	452,402
Iowa	88,268	22,108	1,624,615	New Jersey	64,935	10,936	1,131,116
Kansas	28,034	15,260	996,096	New York	355,913	39,031	5,082,871
Kentucky	30,413	95	1,648,690	Ohio	192,597	9,708	3,198,062
Louisiana	17,475	1,437	939,946	Pennsylvania	168,426	8,280	4,282,891
Maryland	45,481	1,564	934,943	Texas	35,347	11,371	1,591,749
Massachusetts	16,872	3,302	1,783,083	Wisconsin	184,328	22,014	1,315,497

The above States have absorbed almost the entire immigration. They swallow up 96.5 per cent. of all immigrants born in Germany, and only 3.5 are left for all States and Territories not mentioned in the above figures. This fact, as well as the increase of Germans in the above States from 1870 to 1880, make it evident that the rule is that the children prefer to remain where they find already a vigorous branch of their countrymen has been planted. Single States in America must have a very prominent German character. For example, the immigrants born in Germany are 14 per cent. of the whole population of the State of Wisconsin; in Minnesota, 8.5 per cent.; in Illinois, 7.7 per cent.; in New York, 7 per cent.; in Nebraska, 6.9 per cent.; in Ohio, 6 per cent.; in New Jersey, 5.7 per cent.; in Iowa and Michigan, 5.4 per cent.; and in the rest of the States from 6.9 per cent. to 2.2 per cent. That in some of these States the German element must have been already for a long time very prominent becomes still more evident if we look at the population in these States as it existed in the middle of the century. Franztöher mentions as States which could become especially German, Ohio, Indiana, Illinois, Missouri, Iowa, Wisconsin, Michigan, and Upper Canada.

Further, Pennsylvania and a part of New York on the one side, and Texas on the other, would become the boundary line as far as the sea. The thickest of the German population would be between the waters of the Ohio and the Missouri, while north are the Yankee States, and south of these the old slave States.

According to the statistics of the port of Boston, in 1844 the number of Germans in the United States amounted to 4,888,632. On the contrary the entire population in the year mentioned was 18,980,000, from which, according to H. Löher, 3,250,000 slaves and colored persons should be deducted, leaving the number of whites 15,730,000. Therefore one-third of the white inhabitants of the United States consists of Germans. Löher considers these figures to be too high. By his reckoning, which is made with great knowledge of the relations concerned, the number of Germans in the year 1846 in the United States diminished to between one-fifth and one-fourth of the entire white population. In this juxtaposition only those inhabitants are considered as Germans who in the year 1846 still used the German language. Now there was about this time in these States, which in the last ten years have mainly absorbed the German immigration, an equally strong tendency to German emigration. Already in the year 1846 in some of these States the German inhabitants comprised about 40 per cent. of the entire population.

A CONSUL'S VIEWS OF EMIGRATION.

The following is a statement from our consul at Hamburg:

It so seldom occurs that emigrants apply at the consulates for emigrants' invoices that it can not be estimated as a circumstance producing a knowledge of the character and condition of the emigrants. The Consular Regulations do not require consuls to make an inspection of emigrants at the ports of embarkation, hence the consuls' information as to what classes emigrate, whether they are intelligent and able-bodied, or whether they intend to become citizens, must of course be very limited. My knowledge of the emigration from this port to the United States is restricted to such observations as are made on meeting them on the streets as they are passing on their way to ocean steamers.

Another fact noticeable is that 68 per cent. of the emigration by way of Hamburg is from other European and non-European countries, the emigrants merely passing through Hamburg, giving me no opportunity to ascertain whether they are going to the United States to become citizens or whether they are intelligent and able-bodied or not. Of the entire emigration to all countries by way of Hamburg 8 per cent. were farmers, 12½ per cent. artisans, 13¼ per cent. tradesmen, 32.68 per cent. laborers, 1¼ per cent. other occupations, and 32.22 per cent. were persons without occupation.

"Efforts of persons to promote and stimulate German emigration must be secret

and clandestine. Such efforts could not be widespread and continuous without being discovered. Charitable and other associations intending to ameliorate the condition and assist struggling humanity may occasionally aid some person or persons to emigrate to the United States to improve their opportunities of making a living, but such action is kept within the bosom of the association and is not known even to the steam-ship company transporting them.

The methods adopted by the steam-ship companies to secure business and patronage of their lines are such as are calculated to induce their booking agents through cupidity to stimulate and encourage emigration of the people. The booking or steam-ship company's agents are licensed by the Government, and are required to file bonds to the amount of about $5,000. They are to show that they have a contract with one steam-ship company to transport such passengers as they may book. The laws controlling the actions of these agents are intended to promote the welfare of the emigrants, and protect them from frauds, misrepresentations, and from persuasions to emigrate.

The steam-ship company fixes a limit upon the amount they shall take from the passenger for his transportation. Out of this sum they are to remit to the steam-ship company a certain amount; the balance is returned as their commission, which is generally a liberal percentage of the sum received. These agents advertise largely in the newspapers. The steam-ship company receives from railroads, State immigration commissioners, and immigration societies printed matter descriptive of the country and often holding out glittering promises of great success to immigrants, and this is placed with the booking agents for distribution.

The indiscriminate distributing of this printed matter is, however, forbidden by the Government. The agents are permitted to place it alone with those who voluntarily inquire for it. As the steam-ship company and booking agents both depend upon the movement of the people for their pecuniary success, it is their interest to promote emigration, and doubtless more or less efforts are made by these agents to create a traffic of this nature. It is not within the scope of my knowledge to assert that these efforts are made through misrepresentation.

There are also a number of boarding-houses established in Hamburgh for the entertainment of emigrants; whether the proprietors of these houses make any efforts to stimulate a spirit of emigration, I am unable to state.

The steam-ship companies have also appointed agents in nearly all the towns in the United States to encourage, direct, and collect traffic for their lines. Not an insignificant portion of the money received from passenger traffic is paid by these agents for what is denominated "prepaid tickets."

I am informed by the pool agent in Hamburg of the English steam-ship companies that 25 per cent. of the emigration by way of Hamburg to the United States goes over on "prepaid tickets," that is, upon tickets purchased in the United States and sent to the emigrant in Europe.

I am also informed by the Hamburg American Packet Company that about 40 per cent. of all emigrants by their line travel on what is known as "prepaid tickets." These agents are allowed a very generous percentage on all tickets they sell. It is my impression that the great number of assisted emigrants who are thrown upon our shores receive their assistance from persons residing in the United States. The steam-ship companies have adopted only legitimate methods to secure business. It can scarcely be imagined that a steam-ship company can know the condition of the emigrants who go by their lines, nor can it know the character and class, except on their outward appearance.

The steam-ship company that receives from its agent in St. Paul, Minn., a remittance for the passage of a person residing in Hungary is not presumed to know whether the person whom it is to transport is a convict or a laborer under contract, nor is it reasonable to suppose the agents always know. A manufacturer or other person in the United States desiring labor, writes to Europe to know if he can obtain a certain

kind of labor, and upon receiving a favorable answer he goes to an agent, purchases tickets for certain persons, the agent remits the passage money and names to the steam-ship company and the tickets are sent to the persons. It is in this way that the laws of the United States forbidding the landing of contract laborers are so constantly violated. Unquestionably many of those who go by prepaid tickets are induced and assisted by members of their families or friends who have become firmly settled.

There is a large number of emigrants who go through Hamburg to the United States by the English and other lines of steam-ships, which is denominated in direct emigration. Statistics does not furnish what proportion of this emigration going to the United States have occupations or trades, but the emigration from Germany and other European and non European countries which passes through Hamburg is classed in occupations as follows: Eight per cent. farmers, 12.5 per cent. artisans, 13.1 per cent. tradesmen, 32.68 laborers, and 32.22 per cent. without occupations.

From my knowledge of the character of German emigrants that have settled in the United States, the good largely predominate. Of course, where there is much light there must also be some shadow. The matter-of-fact modes of life in our country, the dire necessity of working for a livelihood, the non-consideration of their former position and social advantages by our people, and their dependence upon their own exertions put them upon their mettle, and the best characteristics of good citizenship are not unfrequently developed. When this is not the case they become chronic growlers, join the hands of the disaffected.

GERMAN OFFICIAL DATA.

The industrial and social data issued in monthly pamphlets by the Government authorities at Hamburg are models of their class, covering the products of export and import and the completest details obtainable concerning the movements of German emigration. I subjoin several sheets of statistics from these monthly pamphlets, giving more information of an exact statistical quality than is obtainable at any other source.

SELF-HELP EMIGRATION SOCIETIES.

Among the many documents supplied to callers gratis at the London emigration office in Westminster are the following:

SELF-HELP EMIGRATION SOCIETY,
4 *Fleet Lane, Farringdon Street, London, E. C.*

SIR OR MADAM: In reply to your inquiry as to what assistance this society can give, I send you a form which you should fill up and send to me, giving every particular therein asked for.

We send emigrants to Canada during the spring and summer up till the end of July. Persons who are going to homes provided for them by their friends, or to situations, can go at any time. The *first party* leaves London about the middle of April, and sails from Liverpool.

We can find places for hundreds of *good farm laborers and domestic servants*, and a reasonable number of good mechanics, such as carpenters, bricklayers, stone-cutters, and brickmakers. *Professional men, clerks, and shopmen are not wanted.*

Strong, healthy young men who are willing to take *rough work* on farms can be placed in situations without much difficulty.

Many who have paid all their own expenses have in previous years gone out under the auspices of this society in order to secure letters of introduction to our honorary correspondents.

It is important you should understand that this society can only assist with *small grants* those who show, either by the help of their friends or by their own exertions, that they are able to do something for themselves.

The personal character of each applicant is carefully investigated, and this society will not help those who are unlikely to make useful colonists.

The cost of reaching Canada is, for each adult, from London, via Liverpool, to Montreal, £4, including kit. Children between the ages of one and twelve years, half price. Infants under twelve months, 10*s*.

To this must be added the railway fare from Montreal to a suitable country center, say 10*s*. to 30*s*. each, more or less, according to distance.

The cost of passage to Australia is from £13 13*s*. to £16 16*s*.

Please return this form, giving full particulars, and especially stating whether you can raise the whole of your fare. The committee will then make an appointment for you to wait upon them, if they think your case is likely to be suitable, and if you live within a reasonable distance of London.

The office is open during the emigration season every day from 10 to 2, and on Mondays and Wednesdays from 6 to 8 p. m.

R. MACKAY, *Secretary*.

No. —.

Self-help Emigration Society, 4 Fleet Lane, Farringdon street, London, E. C.

APPLICATION FOR ASSISTANCE TO EMIGRATE.

Memorandums by committee.

1. Name of applicant in full ______
2. Age last birthday ______. Usual occupation ______
3. Address in full ______
4. If applicant has a family, state particulars below:
   Age of wife ______
   Her occupation before marriage ______
   Number of children ______
5. Names and ages of children ______
6. Applicant's place of birth ______
7. Occupation until age of 21 ______
8. If now in regular employment, state employer's name and address and business ...... } ______
9. State present wages ______. How long in present situation? ______
10. Has he friends in any colony? ______
11. Name the colony he wishes to go to ______
12. Has he ever lived out of the United Kingdom? ______
13. What amount can he find towards cost of passage? ______
14. What amount will friends find? ______
15. * Names, addresses, and occupations of two references. ______

The foregoing statements are, to the best of my knowledge, perfectly true.

Date ______

Applicant's signature ______

Should there be any willful misstatement in the form, the application will be at once rejected. If any further remarks are necessary, please write overleaf.

* One of these must be a clergyman, minister of religion, or present or former employer.

BRITISH AND IRISH EMIGRATION.

The following tables have recently been issued by the British Government:

BALANCE OF EMIGRATION.

Balance of emigration, deducting total recorded immigration from total recorded emigration.

Years.	Emigration.	Immigration.	Net emigration.	Years.	Emigration.	Immigration.	Net emigration.
1870	256,940	49,157	207,783	1880	332,294	68,316	263,978
1871	252,435	53,827	198,608	1881	392,514	77,105	315,409
1872	295,213	70,181	225,032	1882	413,288	82,804	330,484
1873	310,612	86,416	224,196	1883	397,157	100,503	296,654
1874	241,014	118,129	122,885	1884	303,901	123,466	180,435
1875	173,809	94,228	79,581	1885	264,385	113,549	150,836
1876	138,222	93,557	44,665	1886	330,801	108,879	221,922
1877	119,971	81,848	38,123	1887	396,494	119,013	277,481
1878	147,663	77,951	69,712	1888	398,494	128,879	269,615
1879	217,163	53,973	163,190	1889	342,641	147,398	195,243

Balance of emigration of persons of British and Irish origin only, deducting recorded immigration from recorded emigration of such persons.

Years.	Emigration.	Immigration.	Net emigration.	
			Numbers.	Proportion per cent. of total population of United Kingdom.
1876	109,469	71,404	38,065	0.11
1877	95,195	63,890	31,305	0.09
1878	112,902	54,944	57,958	0.17
1879	164,274	37,936	126,338	0.37
1880	227,542	47,007	180,535	0.52
1881	243,002	52,707	190,295	0.54
1882	279,366	54,711	224,655	0.64
1883	320,118	73,804	246,314	0.69
1884	242,179	91,356	150,823	0.42
1885	207,644	85,468	122,176	0.34
1886	232,900	80,018	152,882	0.42
1887	281,487	85,475	196,012	0.53
1888	279,928	94,133	185,795	0.50
1889	253,795	103,070	150,725	0.40

Destinations of excess of emigrants over immigrants, among persons of British and Irish origin only, in the undermentioned years.

Years.	Country of emigration and immigration.				Total.
	United States.	British North America.	Australasia.	All other places.	
1876	*143	2,706	29,617	5,885	38,065
1877	603	2,033	25,501	3,168	31,305
1878	20,654	4,448	32,272	584	57,958
1879	71,758	14,455	35,992	4,133	126,338
1880	140,052	16,214	18,274	5,995	180,535
1881	146,323	18,151	16,805	9,016	190,295
1882	153,435	34,344	30,418	6,458	224,655
1883	144,870	37,164	64,420	*140	246,314
1884	93,814	22,273	35,943	*1,207	150,823
1885	80,083	10,517	31,449	127	122,176
1886	99,801	17,578	34,096	1,407	152,882
1887	143,183	25,177	23,925	3,727	196,012
1888	131,955	26,036	20,740	7,064	185,795
1889	97,379	19,627	17,856	15,863	150,725

* Excess of immigrants.

CANADIAN NORTHWEST.

FREE GRANTS TO SETTLERS.

Settlers can obtain free grants of land in the Canadian Northwest upon the following conditions, viz:

1. By making entry and within six months thereafter erecting a habitable house and commencing actual residence upon the land, and continuing to reside upon it for at least six months in each year for three years, and doing reasonable cultivation during that period.

2. By making entry for the land, cultivating it for three years, so that at the end of that period not less than 40 acres be under cultivation; residing for at least six months in each year during that time within a radius of 2 miles of the homestead; and erecting a house and residing in it upon the homestead for three months next preceding the application for patent.

3. By making entry and within six months from the date thereof commencing the cultivation of the homestead; breaking and preparing for crop within the first year not less than 5 acres; cropping the said 5 acres, and breaking and preparing for crop not less than 10 acres in addition; and erecting a habitable house before the expiration of the second year, and thereafter residing thereon at least six months in each year; and cultivating the land for three years next prior to the date of the application for patent.

The only charge for a homestead of 160 acres is the entrance fee of $10; in the case of forfeited pre-emptions, an additional fee of $5; and in case of canceled homesteads an additional inspection fee of $10. Settlers have the right to preëmpt the adjoining quarter-section of 160 acres, if available, and, within six months of completion of the homestead duties, may purchase the preëmption at the price of Government lands at the time of making the entry. On failure to complete such purchase, the preëmption may be opened for settlement on conditions stated in the thirty-sixth section of the Dominion lands act.

There are also numbers of circulars giving detailed and explicit information of the industrial opportunities, wages, cost of living of all parts of the Canadas, Australia, Australasia, and South Africa, with the minutest details for all trades and professions.

BRITISH AND IRISH EMIGRATION.

[From the London Telegraph.]

During the last thirty-two years, according to official returns, no fewer than 5,648,000 persons emigrated from the United Kingdom, of whom 60 per cent. went to the United States, and only 20 per cent. to Australia. How much Great Britain would have gained had the proportions been reversed, by the additional stimulus given to her trade and manufactures, it needs no argument to prove. The natural conclusion arrived at is that "the most urgently needed aid to Australian development is selected British and European populations, suitable for settlement on the land, and for raising productions for which there is a large demand in the colonies, the United Kingdom, and foreign countries." What these productions comprise is but imperfectly realized here as yet. Most Englishmen know that Australia has exported any quantity of wool, tallow, copper ore, gold, and wheat; but few know what that beneficent and yet varied climate and soil might do in the growth of sugar, cotton, fruit, and, above all, the vine. The expansion of the wine industry is referred to as illustrating the sources of wealth scarcely tapped as yet.

In Great Britain the consumption of Australian wine during the last ten months was 280,000 gallons; and experts from Bordeaux who have visited the colonies have

fully satisfied themselves of their superior capacity for growing high-class qualities. Details as to this and other products may be multiplied to any extent, but perhaps they are hardly needed. No one questions the natural resources of Australia, and few have permitted themselves any doubt as to these being rapidly developed. Nor will there be any disposition to traverse the arguments in favor of a much larger immigration and a more continuous expansion of agricultural industries. It is pointed out that there are markets—not of the mother country alone—prepared to absorb all the productions of Australian soil for generations to come; that the liquidation of international trade balances would thus be much facilitated and Australian credit strengthened in Europe; and that the solution of the imperial federation problem would be rendered easier. The benefits and advantages being clear enough, why, it will be asked, have not the necessary steps to secure them been long since taken by the Australians themselves? Immigration, we are told in reply, is systematically discouraged there because the working-class element predominates by means of its complete organization for political ends, and this element chooses to regard all imported labor with jealousy and distrust. The immigrant is looked at, not as one who increases the common fund of production and the consumption of articles produced, but simply as a competitor to be received and treated with coldness and jealousy in accordance with the exclusive motto of obstructives to colonial progress—"Australia for the Australians." In fact, the democracy of labor at the antipodes is like the similar organization at work in the United States, which would fain drive out Chinese and keep out Europeans, and is consistently protectionist all through, as it promises to be ere long in England.

GOOD NEWS FOR EMIGRANTS.

[From an English provincial newspaper.]

Most of the emigration failures in the colonies and America have arisen, firstly, through men thinking there are better opportunities abroad than at home for the lazy and the dissolute; and, secondly, from men going to the wrong places, and to the right places at the wrong times. Skilled labor backed by honest industry will get along anywhere; but it is of the last importance to select for its operations settlements where there is an unusual opening for work and enterprise.

The Emigrants' Information Office, 31 Broadway, Westminster, supplies this class of information to all comers, and issues a quarterly paper of intelligence which should be thoroughly circulated. Philanthropical people and institutions devoted to the welfare of the masses would do well to lend a hand to such a practical work as this. The circular contains prospective notes of great importance. During the past quarter there has been much improvement in the labor market of New Zealand and South Australia; and the prospects in New South Wales and western Australia turned out to be far more encouraging to the emigrant than the colonial papers led us to believe. Cape Colony had experienced a comparative scarcity of mechanics, and there is still an opening for workmen connected with the building trades. The Argentine Republic offers, it is believed, solid attractions to European emigrants; and in all the English colonies there are fair opportunities, though without any special demands, for artisans of every class.

We collate these details from the latest emigration circular by way of giving to those who are thinking of emigration an illustration of the correct and authoritative intelligence that is obtainable, without cost or trouble, almost at their very doors. The colonial governments of certain districts offer passages at reduced rates to agricultural laborers and female servants. To the latter, and to mechanics under contract with employers, Cape Colony supplies free and assisted passages. Domestic servants are in demand throughout the colonies, and farmers with capital and common sense need have no fear for their future if well advised as to the particular line

of country upon which they should settle. Fortunately at the moment, English trade is looking up; but at any time the prizes to be won by industry and good conduct are more numerous and of greater value than they can possibly be in the over-populated districts of industrial England.

WHERE BRITISH EMIGRANTS SHOULD NOT GO.

[From the Pall Mall Gazette.]

British emigrants should avoid Chili. Those who have gone there have bought their experience dearly and wish themselves well out of the country. The Chilian Government are very anxious to introduce European labor, and made a contract in April last with the firm of L. de Llanos, Keates & Co., of Brussels, by which the latter undertook to recruit and forward to Chili 25,000 emigrants before the close of the year. Those sent out were largely from Spain, but England was also made a recruiting ground, and the first batch of British emigrants, who arrived at Santiago in November, were not long in discovering their mistake. They complained to Consul Kennedy of the incorrect representations made to them by certain subagents in England, and the misleading information contained in a pamphlet supplied to intending emigrants by the firm of Llanos and Keats. This is specially noticeable in the tables of Chilian money and salaries and wages set out in the pamphlet. There are dollars and dollars, and, as it happens, the Chilian paper dollar—gold and silver coins being practically unknown—is worth not 4*s*., but about 2*s*. It has never been higher than 29*d*., and has been as low as 21*d*. Owing to the depreciation and fluctuation in the value of the paper dollar, and to the high rate of import duties, more articles of ordinary use, such as clothing, and furniture, can be bought for a shilling in England than for a dollar in Chili. The wages appear large, calculated on the basis of 4*s*. to the dollar, but that requires to be halved in order to get at the real value, and even then the figures are too high. Farm laborers, instead of earning £7 to £10 per month, are paid about 1*s*. to 1*s*. 6*d*. per day, and are lodged in mud cabins thatched with bulrushes, and receive beans, bread, and water for daily food.

"Good agricultural laborers," Mr. Kennedy says, "from England or Scotland, or men acquainted with dairy work and cattle-farming, who are willing on first arrival to submit to the discomforts of bad food and lodging and small wages, may hope, within two years, or even sooner, to rise to a position of comparative ease; but, as a general rule, I would not encourage British subjects to try emigration to Chili; they are at a great disadvantage at first, as compared with Italians or Spaniards, or even Frenchmen, who pick up the language quickly, and accommodate themselves more easily to the customs and system of life of the natives."

Mr. Thomas, the vice-consul, takes the same view. "The English emigrant," he says, "is at the same time the best and worst of any which could be imported to this country. He is the most civilized of them, and consequently he brings with him a fund of physical and moral strength which would do immense good to the country in the long run if they could find room for him, and treat him as he deserves and is accustomed to be treated. But for those same reasons he is the most expensive, the most difficult to provide for during the first period of his life here, and because he is a good workman, who occupies all his time in gaining a livelihood for himself and family, if he has one, which is generally the case, he has neither time nor disposition for learning the language, which is of all his greatest difficulty."

COLONIZATION.

[Arnold White in London Echo.]

The successful settlement of willing workers on strange soil will never be accomplished until the difficulties at both ends of the line are so great as to demand the highest qualities of organization, foresight, and resolve. The history of the efforts at colonization during the present century is the history of failure—at all events, to the schemes as they were framed by the philanthropic inventors. The convict colonies of Australia, begun in spite of all reason, and pursued in defiance of all experience, were said at the time to be the beginnings of an "imprudent nation." But the sequel to these measures for peopling the vacant spaces of the earth all point to one conclusion. It is this—no matter how unpractical, how inadequate are the schemes adopted; no matter what pain is caused to the settlers forming part of the experiment, the benefit to the children of the first settlers, and to the mother country by the creation of fresh trade is so great as to be almost incredible. The Canterbury settlement in New Zealand was by no means a success in its original form; but the final issue of the scheme begun by Lord Lyttelton and Mr. Godley was supremely sucessful. The efforts of Lord Liverpool, in 1820, to relieve distress in England, and to people the eastern province of the Cape Colony, resulted in untold misery to the first settlers. But the property of the descendants of those settlers amounts at the present time to over £20,000,000.

Where the war-shout of Kaffirs once rang through the air, the morning hymn of blue-eyed English children now floats across the *veldt*. Where the settlers and their families were done to death, and their property burned and wasted, life and property is now as safe as in Sussex.

In 1857 Sir George Grey repeated Lord Liverpool's experiment, and settled in Kaffirland a legion of soldiers who had fought for us in the Crimea. The sufferings of 1820 were repeated. But thirty years afterwards the children of those German soldiers had reaped in peace and fortune the fruits their fathers had won for them by patience, by courage, and by industry. The lessons from these facts, and many more of similar teaching, are that we have still to learn how to organize success for the pioneers; how to insure a moderate proportion of fortune, health, and education for industrious men, women, and children, who are denied a livelihood in their own country; and how to arrange the outlay of capital so as to avoid pauperization on the one hand, and on the other the dishonest evasion of payment by the settlers.

As was stated in the preceding article on social questions, it is necessary, in the first place, to arrest the influx of pauper foreigners. It is idle to expect that the bone and sinew of England will expatriate themselves until the rubbish of other lands ceases to pour into our crowded labor market. The next point is to obtain suitable land in a suitable climate, with access to markets. It is hopeless to look to colonial governments to provide land. The estate they administer is held in trust for the colonial public, not for the mother country who obtained it by her blood and treasure. It is a waste of pen and ink for Lord Knutsford to ask the colonial governments to help us. We must help ourselves, and where sentiment, gratitude, and loyalty are powerless to obtain the land we want, self-interest will prove the magic lamp that opens any door. While the colonies will laugh at us if we ask their help for the love of the Queen, for affection to the old country, for gratitude towards those who have allowed them to occupy the lands in which they live, they will listen to us if we can show that there are dollars in our scheme.

My plan for obtaining land is this. It has been tried. It is succeeding at the Tennyson Settlement in South Africa. The unearned increment of value on land, arising from the residence of human beings in the neighborhood, operates as swiftly and as truly in Australia, in South Africa, or in Canada, as on Lord Cadogan's or on the Duke of Bedford's London properties. In the colonies land is held in vast tracts. If a Cape Dutchman sees another man's smoke in the far horizon he thinks himself

crowded, and contemplates migration to a less populous place. Little or nothing is done to some of these vast estates, and their value is potential rather than existent. Enlightened people are to be found in the colonies quite as readily as in England. On pointing out to these lords of the soil that the value of the whole would be increased by placing an industrious population on a portion of the estate, it will be possible to obtain the cession in perpetuity of land for settlement for the consideration of locating an industrious population, equipped with the raw material of success, on the land ceded, the population thus placed to pay the original owners a moderate rate of quit-rent, on the same plan as that adopted for Government or Crown lands. Often it happens that the part is greater than the whole. The size of the cake is immaterial if your portion of it is satisfactory to you. But to carry out this plan honest men are needed. Too many rogues have made of emigration a happy hunting ground.

WAGES IN EUROPE AND IN THE UNITED STATES.

[Note by the Department of State.]

Throughout the foregoing work repeated references are made to the rates of wages in Europe and the United States. As such references are not based on exact official data, the following tables from "Labor in Europe," as published by the Department of State, are given.

These tables cover the year 1884, but the relative conditions in Europe and in the United States have not materially altered since then, so that the rates are, generally, as applicable to the year 1890 as they were to 1884.

I.—GENERAL TRADES.

Comparison of the average weekly wages paid in the general trades in Europe with those paid in similar trades in New York and Chicago.

Occupations.	England and Wales.	Germany.	France.	Belgium.	Austria.	Holland.	Switzerland.	Russia.	Chicago.	New York.
BUILDING TRADES.										
Bricklayers	$7.56	$4.21	$5.74	$4.56	$3.55	$4.80	$5.21	$4.32	$24.00	$20.00
Hod carriers	4.94	2.92	3.13	3.22	2.08	3.60	2.99	2.45	10.50	11.00
Masons	7.68	4.07	5.33	5.22	3.73	4.80	5.27	6.72	24.00	18.00
Tenders	5.07	3.15	3.23	3.09	1.92	4.00	3.50	2.88	10.50	10.00
Plasterers	7.80	4.43	6.34	4.66	4.01	4.00	5.03	4.61	27.00	18.00
Tenders	5.27	2.91	3.23	3.02	1.82	4.00	3.40	2.55	15.00	10.00
Slaters	7.10	4.20	5.65	4.98	4.00	4.00	4.35	4.20	21.00	14.00
Roofers	7.35	4.28	5.65	4.97	4.20	......	2.99	3.75	16.50	12.00
Tenders	4.24	2.81	3.64	3.28	2.80	......	3.18	2.60	10.50	9.00
Plumbers	7.90	4.26	6.10	5.46	4.11	4.80	5.18	4.82	22.50	16.00
Assistants	4.69	2.72	3.61	2.93	2.41	2.80	3.36	2.30	5.70	10.00
Carpenters	7.66	4.11	6.20	4.07	5.10	4.80	4.74	3.30	16.50	14.00
Gas fitters	7.66	4.08	6.07	5.00	6.09	5.60	5.04	3.76	18.00	12.00
OTHER TRADES.										
Bakers	6.17	......	......	4.28	4.55 4.72	4.80	3.88	2.92	12.00	7.00
Blacksmiths	7.37	4.00	5.81	5.38	3.18	4.80	5.20	3.72	15.00	13.00
Strikers	5.30	2.94	4.72	3.29	3.15	3.60	4.43	2.72	10.50	9.00
Bookbinders	6.77	4.20	5.17	5.35	4.10	4.00	4.68	3.42	16.50	14.00
Brickmakers	*7.00	3.98	5.32	4.25	6.20	3.20	4.43	2.80	17.40	10.00
Brewers	6.85	......	4.43	4.46	5.87	6.00	3.78	4.06	......	5.00
Butchers	5.50	3.32	......	4.31	3.50	3.60	4.66	2.91	16.50	8.00
Brass founders	7.47	4.38	6.54	6.02	3.60	4.00	4.92	4.20	15.00	10.00
Cabinetmakers	7.68	4.25	6.14	5.66	4.40	4.80	5.59	5.76	15.00	12.00
Confectioners	6.84	3.43	4.85	5.03	......	4.40	5.84	3.36	12.00	......
Cigar makers	6.07	3.63	4.69	6.28	3.00	4.00	3.80	3.80	18.00	11–15

*About.

Comparison of the average weekly wages paid in the general trades in Europe with those paid in similar trades in New York and Chicago—Continued.

Occupations.	England and Wales.	Germany.	France.	Belgium.	Austria.	Holland.	Switzerland.	Russia.	Chicago.	New York.
OTHER TRADES—continued.										
Coopers	$7.50	$3.97	$5.58	$5.17	$3.64	$4.80	$4.78	$3.66	$12.00	$12.00
Cutlers	7.00	3.90	5.16	5.28	3.00	......	4.93	3.91	......	10.00
Distillers	......	3.56	7.06	5.00	3.00	6.00	4.02	4.00	......	9.00
Drivers	......	......	4.80	3.95	......	5.00	......	3.50	......	......
Draymen and teamsters	5.37	2.96	5.57	3.77	2,20	4.40	......	3.60	12.00	10.00
Cab and carriage	5.15	3.21	4.82	3.92	4.00	2.50	......	3.60	......	9.00
Street railways	6.09	3.44	4.47	4.09	3.68	4.40	3.84	2.95	13.50	11.00
Dyers	6.18	3.45	4.83	6.15	3.80	3.60	4.91	3.16	16.50	13.00
Engravers	8.38	5.12	7.35	6.42	4.77	8.00	6.35	4.66	24.00	16.00
Furriers	*8.52	4.20	7.00	6.35	3.67	4.00	4.63	3.66	15.00	13.00
Gardeners	5.80	3.78	5.11	3.91	......	3.60	3.83	3.90	12.50	9.00
Hatters	6.10	4.36	5.50	4.60	3.85	4.00	3.84	5.10	......	13.00
Horseshoers	6.32	3.61	5.89	5.62	1.20 3.48	4.40	4.65	3.75	18.00	13.00
Jewelers	8.76	5.21	6.24	6.84	3.80	......	6.35	4.15	13.50	11.00
Laborers, porters, etc	4.70	3.11	3.93	3.77	3.00	3.20	3.61	2.88	10.50	9.00
Lithographers	7.07	5.59	7.07	5.86	5.93	4.80	5.51	4.88	......	12.00
Millwrights	6.97	4.18	6.74	5.00	3.10	4.80	6.30	3.30	......	14.00
Nailmakers (hand)	5.90	3.12	4.84	......	......	......	2.64	3.65	......	......
Potters	5.20	3.69	4.78	4.86	3.17	......	4.17	5.76	......	10.00
Printers	7.17	......	6.64	5.94	4.85	6.00	5.93	5.76	18.00	13.00
Teachers public schools	†12.00 ‡7.70	....	7.00	7.74	8.47	6.40	......	9.60	......	13.00
Saddle and harness makers	6.63	3.69	5.70	5.51	3.80	......	5.20	5.10	12.00	11.00
Sailmakers	7.02	2.85	6.04	4.56	3.80	4.80	......	2.59	15.00	12.00
Shoemakers	......	2.95	2.90	......	......	4.00	......	......	......	11.00
Stevedores	8.44	5.70	6.72	4.36	7.40	......	......	2.88	18.00	12.00
Tanners	6.38	4.85 3.80	5.18	5.81	4.15	4.00	4.92	4.90	......	......
Tailors	7.40	3.41	5.02	5.58	4.03	5.00	6.36	3.42	......	7.12
Telegraph operators	7.65	5.11	6.92	6.35	6.75	5.60	......	6.55	......	12.00
Tinsmiths	6.56	3.55	5.46	4.40	8.70	4.00	4.40	2.96	12.72	11.00
Weavers (outside of mills)	6.31	2.79	3.23	3.95	3.15	3.60	3.05	2.96	......	10.00
Machinists	......	4.60	......	......	......	......	......	......	18.00	......
Painters	......	4.82	......	......	......	......	......	......	12.00	......
Upholsterers	......	4.52	......	......	......	......	......	......	18.00	......

* With board. † Men. ‡ Women.

To reduce the foregoing statements to an equitable level of comparison, the following tabulation is given, showing the rates of wages in the principal cities of Europe as compared with those in the United States:

I.—GENERAL TRADES.

Occupations.	London.	Antwerp.	Bremen.	Berne.	Vienna.	Amsterdam.	Rouen and Marseilles.	Copenhagen.	Turin.	Riga.	Chicago.
BUILDING TRADES.											
Bricklayers	$8.40	$4.40	$4.50	$7.50	$4.50	$4.80	$6.95	$7.00	$4.20	$4.32	$24.00
Hod carriers	4.60	3.12	3.50	2.22	2.60	3.60	3.47	4.30	1.70	2.45	10.50
Masons	8.40	6.00	5.00	6.06	3.40	4.80	5.79	5.36	3.60	6.72	24.00
Tenders	4.60	3.12	3.65	3.90	2.60	4.00	3.47	4.29	1.70	2.88	10.50
Plasterers	7.50	4.40	4.50	6.36	3.65	4.00	6.95	6.97	5.04	6.72	27.00
Tenders	4.60	3.12	3.61	3.90	1,72	4.00	3.47	3.86	1.70	2.60	15.00
Slaters	7.50	5.00	4.35	3.78	4.00	4.00	6.94	......	4.20	4.80	21.00
Roofers	7.50	......	4.35	3.78	4.20	......	6.94	8.00	4.20	3.75	16.50
Tenders	4.60	......	3.39	3.08	2.80	......	4.34	4.50	1.70	2.60	10.50
Plumbers	8.10	4.40	4.57	4.94	4.50	4.80	6.95	6.90	3.60	4.32	22.50
Assistants	4.87	3.05	3.20	3.36	2.50	2.80	3.47	4.29	1.70	2.30	5.70
Carpenters	8.00	4.82	5.00	5.20	5.50	4.80	7.50	7.00	4.00	4.80	16.50
Gas fitters	8.00	5.79	4.11	3.78	5.18	5.60	7.50	5.90	3.40	5.28	18.00

I.—GENERAL TRADES—Continued.

Occupations.	London.	Antwerp.	Bremen.	Berne.	Vienna.	Amsterdam.	Rouen and Marseilles.	Copenhagen.	Turin.	Riga.	Chicago.
OTHER TRADES.											
Bakers	$6.50	$2.70	$3.55	$4.32	$4.75	$4.80	$4.84	$4.25	$4.00	$3.84	$12.00
Blacksmiths	7.80	5.50	4.28	5.40	3.50	4.80	6.00	4.82	3.60	3.84	15.00
Strikers	6.00	2.45	3.57	4.62	3.35	3.60	5.00	4.82	3.40	2.75	10.50
Bookbinders	7.00	4.63	5.15	4.80	4.20	4.00	6.18	4.82	3.80	3.84	16.50
Brickmakers	6.00	3.20	4.75	4.92	3.40	3.20	6.00	5.90	5.00	3.36	17.40
Brewers	7.00	3.20	4.61	3.78	4.20	6.00	6.00	3.75	8.00	5.76	15.00
Butchers*	4.38	2.90	3.60	4.32	4.50	3.60	5.00	4.37	......	4.32	16.50
Brass founders	8.10	6.95	4.28	4.92	4.00	4.00	7.50	4.82	4.60	4.80	15.00
Cabinetmakers	8.80	6.00	3.33	4.62	4.00	4.80	7.90	4.58	3.40	5.76	15.00
Confectioners	6.00	4.65	3.43	6.36	......	4.40	4.85	4.25	3.75	3.60	12.00
Cigar makers	6.80	6.50	4.19	3.30	3.00	4.00	6.00	5.09	3.00	6.00	18.00
Coopers	8.00	3.47	4.28	3.78	4.20	4.80	6.95	4.82	2.60	4.32	12.00
Cutlers	8.00	4.65	3.92	4.32	3.00	......	5.79	6.10	3.80	4.32	......
Distillers	......	5.21	2.86	4.02	4.00	6.00	5.79	4.50	4.20	5.76	50.00
Drivers:											
Draymen and teamsters	6.50	2.95	3.17	3.06	2.40	4.40	7.53	3.22	1.50	3.60	12.00
Cab and carriage	5.00	3.00	2.46	3.06	4.60	2.50	5.40	4.80	2.50	3.60	......
Street railways	7.50	4.63	3.10	3.06	4.05	4.40	4.82	4.29	3.60	2.40	13.50
Dyers	7.50	6.00	3.53	4.62	4.00	3.60	6.00	4.29	3.20	4.32	16.50
Engravers	8.50	6.00	4.92	5.76	4.60	8.00	8.75	8.00	6.60	4.32	24.00
Furriers	8.50	7.53	3.15	5.22	4.60	4.00	8.50	5.36	4.60	4.32	15.00
Gardeners†	5.20	4.40	3.10	3.66	......	3.60	5.79	4.00	4.00	4.80	12.50
Hatters	5.40	4.75	4.35	4.62	4.00	4.00	5.21	5.00	5.20	7.20	......
Horseshoers	7.10	4.05	3.00	3.64	3.48	4.40	5.79	4.82	5.20	4.80	18.00
Jewelers	8.00	6.50	5.67	5.76	5.20	.....	8.80	5.36	3.80	4.80	18.50
Laborers, porters, etc	4.87	3.47	3.63	3.78	3.20	3.20	6.00	4.29	3.60	2.83	10.50
Lithographers	8.50	5.80	3.90	3.78	5.60	4.80	9.00	5.50	......	5.76	24.00
Millwrights	8.70	3.00	3.57	6.60	3.10	4.80	9.80	5.87	......	4.80	......
Nailmakers (hand)	......	......	3.57	2.64	......	......	4.84	4.82	3.20	4.80	......
Potters	4.40	4.25	4.28	3.78	3.20	......	{6.10 / 11.58}	4.22	5.20	5.76	......
Printers	7.80	5.80	......	6.06	5.80	6.00	11.00	5.36	4.60	5.76	18.00
Teachers:											
Males	15.00	7.45	......	......	......	......	......	......	......	......	......
Females	7.60	......	......	......	6.00	6.40	10.00	10.00	5.00	9.60	......
Saddle and harness makers	7.80	5.00	3.75	4.32	4.50	......	7.25	4.82	......	4.50	12.00
Sailmakers	7.30	5.80	2.85	......	3.80	4.80	6.95	4.82	2.80	2.50	15.00
Stevedores	8.00	5.00	5.70	......	7.40	......	5.79	5.00	2.00	2.88	18.00
Tanners	7.00	5.50	3.57	4.92	4.50	4.00	6.94	5.09	2.20	4.80	16.00
Tailors	7.50	4.50	3.95	6.36	4.40	5.00	6.00	5.50	4.00	3.84	15.00
Telegraph operators	8.00	6.50	5.75	......	7.50	5.60	8.60	6.50	5.20	5.25	20.00
Tinsmiths	7.00	3.47	4.25	3.66	4.20	4.00	6.90	6.70	6.60	4.32	12.72
Weavers (outside of mills)	......	......	2.50	2.64	3.30	3.00	3.50	3.00	5.20	4.00	......

* With board. † With house.

From the foregoing statement it appears that bricklayers and masons in Chicago are paid very nearly three times the wages; plasterers, nearly four times; slaters, three times; plumbers, nearly three times; carpenters, twice; blacksmiths, twice; bookbinders more than twice; brickmakers, nearly three times; brass founders and cabinetmakers, nearly twice; confectioners, twice; cigar makers, nearly three times; coopers, once and a half as much; draymen, teamsters, and street railway drivers, nearly twice; dyers, more than twice; engravers, nearly three times; furriers, twice; horseshoers, three and one-half times; jewelers, more than one and one-half times; laborers, porters, etc., more than twice; lithographers, three times; telegraph operators, twice and one-half; sailmakers, more than twice; printers, twice and one-half times; saddlers and harness makers, more than one and one-half times; stevedores, more than twice and one-fourth times; tailors, twice; and tin-smiths, once and three-fourths the wages paid to similar trades and callings in London.

PRICES OF THE NECESSARIES OF LIFE.

[From Labor in Europe.]

The next obvious basis for a comparison is the purchasing power of the wages earned in the several countries.

It is frequently asserted that the cheapness of living in Europe more than equalizes the lower wages there paid.

In the volume on labor in Europe, published by this Department in 1878, it was shown that the prices of food in the United States were actually lower than in Europe, and that the working classes in the United States could purchase more and better aliment, dollar for dollar, than the working classes of any country in Europe. The contrary impression is probably due to the fact that the working people of Europe live more cheaply than the working people of the United States, from which it is inferred that the purchasing power of their wages is greater than the purchasing power of similar wages here. It appears from the reports hereto annexed that the American workingman consumes more and better food than the mechanic or laborer abroad, and that the cost of this food is as small in the United States as in Europe.

The following statement gives the retail prices of the principal articles of food consumed by the laboring classes in seven European countries, and of the same articles in New York, Chester, Pa., Newark, N. J., and Chicago. The European statistics are compiled from the consular reports, and those for the United States have been kindly supplied by the same person who furnished the rates of wages in the cities named:

Retail prices of the necessaries of life in Europe and the United States.

Articles.	England (Liverpool).	Germany (Berlin).	Switzerland (Berne).	France (Marseilles and Rheims).	Austria (Vienna and Prague.)
Meats:	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
Bacon .... per pound..	12 to 20	....	....	15 to 20	15 to 18
Ham .... do....	24	25 to 30	— to 30	40 60	30 38
Beef .... do....	14 20	17 20	15 18	14 30	10 10
Mutton .... do....	16 20	17 20	14	14 25	9 16
Veal .... do....	16 20	22 25	16 18	25 35	9 18
Pork .... do....	16 20	16 20	18 20	15 20	....
Sausage .... do....	16 20	....	....	....	....
Horse and donkey flesh ..... do....	....	....	....	5 13	....
Groceries:					
Sugar .... per pound..	4 7	8 13	8	6½ 12	7 8
Tea .... do....	32 89	70 $2.00	$1.00 $1.50	$1.00 $1.40	....
Coffee .... do....	24 40	20 40	18 32	35 60	....
Butterine .... do....	12 24	....	....	....	....
Butter .... do....	24 32	20 38	30	32 60	25 27 16 28
Dripping .... do....	12 16	....	....	....	....
Lard .... do....	12 16	18	20	12 16	12 16
Cheese .... do....	12 22	20	....	14 24	....
Rice .... do....	4 8	5 10	6	5 10	6
Flour .... do....	3½ 4	4½ 5½	4 6	5 10	3 5
Corn meal .... do....	....	5½ 6	....	3 5	....
Bread .... do....	2½ 4	5 9	4 5	....	3
Oatmeal .... do....	4 9	5½ 6	....	....	....
Potatoes .... do....	$\frac{8}{10}$ 1	1	8	1 2	1 2
Cabbages .... each..	2 5	....	....	4 12	....
Codfish .... per pound..	8 12	9	....	....	....

Retail prices of the necessaries of life in Europe and the United States—Continued.

Articles.	Belgium (Brussels).	Holland (Amsterdam).	New York.	Chicago.	Chester, Pa.	Newark, N. J.
Meats:	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
Bacon............ per pound..	16 to 20	16 to 18	16 to —	14 to 20	— to 12	— to 18
Ham.....................do....	30	16 26	16	14 18	11 16	12 18
Beef.....................do....	15 17	15 29	10 25	6 15	8 56	16 22
Mutton...................do....	18	16 24	11 15	9 12	9 18	14 16
Veal.....................do....	18	14 22	17 25	10 18	10 20	8 20
Pork ....do....	16	....	8 13	12½	10 15	12 18
Sausage ....do....	....	....	16	10	12	15 18
Horse and donkey flesh.do....	....	9 13	....	....	....	....
Groceries:						
Sugar............per pound..	12	9 15	8	7 8½	6½ 8	8
Tea......................do....	....	17 54	25 70	25 1.00	30 80	40 60
Coffee ....do....	16	13 25	20 32	20 35	20 25	30
Butterine...........do....	....	16 22	....	....	....	....
Butter...................do. ..	20	22 33	30	20 28	25 32	25 35
Lard.....................do ..	....	16 22	15 16	12½	12	14 16
Cheese...................do....	....	13 23	20	12½ 14	12 16	16 18
Rice ....do....	4 5	3½ 6	10	5 9	8 10	10
Flour....................do....	....	4 6	5	3 5	3 4	3 4
Bread....................do....	3 5	2½ 5½	....	5 7	5	....
Oatmeal ....do....	....	....	....	4	5	6
Potatoes.................do....	1	1	....	1½	1½	2½
Cabbages.............. each..	2	....	....	....	....	....
Codfish .... per pound..	....	....	....	8 12½	5 8	12

It should be borne in mind, in making a comparison, that the better classes of food, the beef, mutton, veal, butter, and rice, are not only for the most part cheaper in the great cities of the United States than in Europe, but they are here daily necessaries for the table of the better grade of skilled workmen, rarely absent from some one meal of the day, and often present at the morning and evening meal; while the concurrent testimony is that, even to the best-paid working classes of Europe they are, in the main, luxuries which are seldom enjoyed; so that, as far as meats of all kinds are concerned, especially fresh meats and ham, they can be passed over as of little comparative value. The lower classes of Europe usually eat dark or black bread, so that even wheat flour and wheat bread may be set aside with the meats as furnishing no sufficient basis for comparison.

Besides this, several articles which are staples of food in Continental Europe, the *garbanzos* or chick-peas of Spain, the *poleata*, or coarse corn meal with bran, of Italy, the blood puddings of Germany, and the like, are not found in the markets of the United States; so that, outside of England, where the food supplies approximate in kind and degree to those of this country, there is but little left in common whereby to make comparisons between the food-purchasing power of wages in Europe and the United States.

The working classes of Europe live mainly on black or rye bread, potatoes, cheap coffee and tea, vegetable soups, and lard and olive-oil of a low grade take the place of butter.

As to quality, the contrast which has been mentioned in the case of bread and breadstuffs extends to many other items of the list. The coffee of the poorer classes, for instance, is not only of a lower class, but is largely adulterated with chicory and fortified by a so-called "coffee essence." Consul Smith of Mayence reports an instance of a laborer at Mayence earning 50 cents a day on which to maintain himself, a wife and five children, who buys among other things "a package of 'surrogate coffee,' which lasts about two weeks," and which costs 2½ cents.

The standard noonday meal of the working men of Mayence is thus given by Consul Smith: Potatoes and a little meat with peas or beans cooked together in the form of a thick soup, to which a little green cabbage or lettuce is sometimes added. This dish they eat day after day with very little change in the character of its contents or in the manner of its preparation. This is the dinner eaten at his work; the food of the wives and children at home is said to be cheaper and less nutritious.

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SPECIAL CONSULAR REPORTS.

OLIVE CULTURE

IN THE

ALPES MARITIMES.

REPORT FROM CONSUL BRADLEY, OF NICE, IN ANSWER TO A CIRCULAR FROM THE DEPARTMENT OF STATE.

ISSUED FROM THE BUREAU OF STATISTICS, DEPARTMENT OF STATE.

ALL REQUESTS FOR THESE REPORTS SHOULD BE ADDRESSED TO THE SECRETARY OF STATE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1891.

OLIVE CULTURE IN THE ALPES MARITIMES.

REPORT BY CONSUL BRADLEY, OF NICE.

INTRODUCTORY REMARKS.*

I have the honor to send herewith my report on olives. The Alpes Maritimes produces more of them than any department of France with one exception, and probably now gives more scientific attention to their culture than any. It is decidedly the most important agricultural industry of my district. Since receiving the questions from the Department of State I have received letters from California, Texas, and Florida in regard to them.

For these reasons, and as I am somewhat familiar with the language, I felt it necessary to look into the subject with some care personally, and give something of the researches made by scientists of late years, particularly of M. Peragallo on the insects more or less harmful to the tree and fruit; of M. Gos on manures and pruning; and Mr. Brullé on adulteration. There is a great deal of adulteration of the olive oil, and Mr. Brullé finds it hard to gain recognition for his discoveries.

*This valuable report was received too late for insertion in "Fruit Culture in Foreign Countries."

IMPORTANCE OF THE OLIVE TREE.

Importance of the tree.—Mr. Gos, in his interesting little brochure on the regeneration of olive culture, says regarding the importance of the tree to the agricultural community:

It is possible in this mild climate and near the sea to obtain in good soil from other plants that can be raised to perfection net products worth more than can be realized from the same extent of land planted in olives; but given identical conditions of soil nothing gives equal results. The soil it occupies would be without the olive left barren. It encroaches upon the territory of no other plant, and to dig it up is generally a bad speculation. The olive prospers and yields its oil, so highly esteemed, in calcareous, gravelly, dry, or arid soils in the narrow valleys of the "Alpes Maritimes," on slopes precipitous and water washed, which could not be used for the culture of annuals. It is, besides, a forest tree of the highest order, and its disappearance from our region would be a veritable calamity.

The olive covers about 70,000 acres in the department of "Alpes Maritimes," it yields a revenue of $2,000,000, and is the only income of many families.

VARIETIES.

There seems to be but two species of olive trees in the south of France: First. The Oleaster (wild olive), having a kind of thorn, very short leaves, and producing only a few small berries, which neither the Dacus nor the boring caterpillar will attack.

Second. The Sativa (cultivated olive), leaves lanceolate, fruit large, often attacked by the dacus. Seedlings of the sativa sometimes deteriorate so as not to be distinguished from the oleaster.

Varieties are as numerous as those of peaches or other fruits in the United States. From fifty to a hundred have been described and named in much the same arbitrary manner, with this perplexing difference, that the names are given in five or six different languages or dialects.

Mr. Barbe, sr., in his "Etudes sur les Oliviers," describes four varieties, as follows: The Blanquetier, which grows large, branchy, with light green foliage; the fruit is small, the pulp has at first a bitter taste, then a mellow after taste; the oil is abundant; it blossoms freely, but too often disappoints the hopes of the farmer for fruit.

The Blavier, which has a very rustic appearance, is very hardy; its fruit is oblong and comparatively large; the pulp is coarse, the oil deeply colored; the fruit is sensitive to cold.

The Arabanier or Araban is less rustic and less lofty than the last; its foliage is poor, the fruit round; the oil is of ordinary quality, better when made from fruit not quite ripe. This tree is hardier than either the Blavier or the Blanquetier, and resists better the effects of wind and frost.

The Cailletier, well known and popular for years past, grows tall; its branches hang low, the leaves are glossy dark green on the upper surface, nearly white underneath; the bark is rough and of a gray hue; the tree appears less green than the other varieties because of the disposition of the branches; the fruit, in clusters at the ends of the branches, is of good size, convex on one side, concave on the other; yields oil which is of superior quality in all points. This tree, also known by the characteristic name of Pendoline, thrives best in dry lands; at its best, its fruit sells for a third more than others for mixing with poorer qualities. It is a robust tree and can be severely pruned. Its greatest enemy is the Dacus oleæ or Keïron. Cattle, too, if pastured in the grove, must be kept from its low-hanging branches. Other good varieties for oil are the Nirvana, also called Noustrales and Brocienne; the Auriola, also called Pignola; the Nicoise, the Blanche, the Roberon, the Negrette, the Sager, the caillan, etc.

For preserving the Verdale, a large oval fruit, the Amenlean, the Lucques, a small variety with sharp pointed stone. The Poncinere, grown everywhere in the "Alpes Maritimes," the Calliache, too, and the Picholine are well liked.

WORKING AN OLIVE ORCHARD.

With the olive, however, as with our fruit trees, the best named do little if left to themselves; care and cultivation seem of even more importance than the name of the variety, although it is certainly advantageous to get young trees from groves which have made some varieties celebrated.

I would suggest for the commencement of a grove the Cailletier and Nirvana, or Noustrales for oil, and the Verdale and Lucques for preserving.

Propagation.—The olive is propagated readily by any of the methods in use among our fruit orchards. A Nicois farmer who wishes a new grove generally transplants wild young trees, planted by the birds in the woods, and when they are well started grafts upon them the desired variety. The wild stocks give hardier trees. For a long time it was thought almost impossible to cause an olive stone to sprout; but the fact that seeds, having passed the digestive organs of birds, sprouted readily enough, taught that only a thorough washing, to remove the oily substance which protects the stone from moisture, was necessary to produce the desired result; some, however, plant only the kernel. Cuttings from root or branch, well soaked for a day be-

fore being planted at a depth of 5 or 6 inches and afterwards watered, do well.

Planting.—Trees in an orchard should be at least 45 or 50 feet apart.

Cultivation.—It pays to work the ground lightly around the olive trees several times a year, not deep enough to break the rootlets, which are wide-spreading, but enough to let the moisture penetrate readily and destroy the weeds.

Manuring.—The question of manure is one of utmost importance, and for the double reason that elements taken from the soil by successive crops must be restored to prevent utter exhaustion of the soil and consequent deterioration of the crop and fruit, and that we may give strong appropriate food to the tree to increase the amount and value of the fruit. To accomplish all these ends analyses of soil, wood of the tree, leaves, and fruit at different seasons of the year must be made to find out what elements are needed. Here the authorities only differ as to amounts and frequency of application, some trying to produce a crop every year, others a crop every 2 or 3 years. Mr. Peragallo says, every 2 years in winter, before the rains, give each tree either 450 pounds of barnyard manure or 6½ pounds of guano; in odd years give them either fresh earth, soot, or plaster taken from old buildings.

Mr. Barbe says: Nothing comes amiss, from weeds, plowed under, to woolen rags, the latter preferred to almost anything, sometimes mixed with horn and old leather; this only needs renewing once in 6 years. To avoid generation of too great heat the rags, horn, or leather should not be buried deep nor close to the tree trunk.

Mr. Brullé, of the Nice Agronomic Station, has carried out a very complete series of experiments which space forbids translating in full. He says:

> Our final decision was that sulphate of ammonia and woolen rags were the best manures. The first increased the crop and fruit, the second produced a strong, healthy growth of wood and leaves necessary to the welfare of the trees. Forcing young trees with sulphate of ammonia must be done with care, for they can not produce wood enough to keep up the proper balance between the crop and growth of the tree.

He gives, finally, as a formula for young trees:

	Kilos.
Woolen rags	4
Chlorate of potash	0.350
Sulphate of iron	0.350

This amount to each tree.

For older trees in full bearing, the quantity for each tree as follows:

	Kilos.
Woolen rags	3
Sulphate of ammonia	0.500
Chlorate of potash	0.350
Sulphate of iron	0.350

In the two formulæ the sulphate of iron and ammonia should be put on in the spring, the rest in autumn.

The lectures that Mr. Gos, professor of agriculture at Nice, delivers to the farmers throughout this department on this subject are so full of interest that I give large extracts as follows:

"Hardy as it is, the olive tree is not an exception in the vegetable kingdom. It demands for the best results an abundant and appropriate nourishment, and its harvest is given in proportion to the amount of manure used; if the soil, as is often the case, is not provided with the elements which are indispensable to its welfare, the olive tree decays and its fruitfulness is checked. It is not to be denied that many groves live on exhausted lands, and it is often the case of those which formerly produced largely. Nothing is more logical and natural; it is not possible to obtain crops from a soil for an indefinite length of time without ever restoring some of its elements taken each year with the crop. The farmer who does not give back these elements, or, in other words, does not manure, robs his land, the consequence being unproductiveness and a gradual reduction in quantity and quality of the crop.

However, restitution to be equitable can not be left to chance. There are sundry kinds of manures, and the nature and quality of elements taken from the soil by an olive crop must be known. The chemical analysis without giving strictly accurate results affords useful indications. Mr. de Grasparin appears to be the first who was interested in this question, but his analyses are not complete. After him Mr. Audoynard, the erudite master of the agricultural school of Montpelier, published on the olive tree an excellent pamphlet giving very definite information as to the needs of the tree. He writes as follows:

"Plants, not excepting the olive tree, contain mineral principles which are found again more or less modified in their ashes after their combustion. The composition of these ashes does not show, it is true, the nature of the mineral compounds which are useful to the plant; but for some of them, such as potash and phosphoric acid, it can give useful indications. This induced me a few years ago to study the ashes of the wood, leaves, and fruit of the olive tree.

My analyses were directed at first to young stalks from 2 to 5 years old, with their leaves. They came from several varieties of olive trees in the environs of Nice. Collected in May, 1870, they were not burned to ashes until December. They had been left 7 months in my laboratory, the temperature of which varying from 15° to 25° and from 25° to 10° C., and had become very dry, the leaves breaking in the fingers. It is in that state that they were burned. The description of the results obtained is as follows:

Ashes of young stalks and leaves.

Varieties of olive trees.	Weight of the stalks.	Weight of the ashes.	Ashes per 100 of stalks.	Weight of the leaves.	Weight of the ashes.	Ashes per 100 of leaves.
Wild	217	6	2.70	58	4	6.89
Colomban (*a*)	135	4.4	3.26	114	5.2	4.56
Poncineri	91	2.5	2.74	81	4	4.91
Ordinary (*b*)	125	3.3	2.64	104	5	4.80
Sala	150	3.1	2	82	4.5	5.48
Total	718	19.3	....	439	22.7	....

	Ashes.
Average for 100 of stalks	3.66
Average for 100 of leaves	5.17

I afterwards analyzed the two varieties, *a* and *c*, and found the chemical substances as indicated in the following description:

Description.	Mineral substances found in 1 gramme of ashes of— Stalks. *a*	Stalks. *b*	Leaves. *a*	Leaves. *b*
Carbonic acid (CO^2)	0.195	0.148	0.280	0.222
Phosphoric acid (PhO^5)	0.019	0.033	0.080	0.037
Potash (KO)	0.135	0.147	0.154	0.145
Lime (C_aO)	0.225	0.180	0.324	0.258

Those olive trees came from a calcareous soil and still their ashes do not show a large proportion of lime; the quantities of potash and phosphoric acid are below those generally found in the vine branches.

In taking the averages of the preceding numbers it is found that 100 parts of—

Dry stalks—
- Contain in phosphoric acid 0.10
- Contain in potash 0.35
- Contain in lime 0.50

Dry leaves—
- Contain in phosphoric acid 0.29
- Contain in potash 0.74
- Contain in lime 1.45

MINERAL COMPOSITION OF THE FRUIT OF THE OLIVE TREE.

It also seemed to me useful to find the principal mineral substances contained in the olive. I at first proceeded to the burning to ashes, which presents some difficulties. At the first exposure to fire the olives flame and are speedily covered with a white crust which stops the combustion; as this crust is soluble in water, a washing dissolves it. After two or three washings a perfect incineration is obtained, and this last product, with the residue of washing, composes the ashes. In following this method I got the following results for four samples of olives, three coming from a calcareous and one from a siliceous soil. I designate the

three first samples by the three letters, *a*, *b*, *c*, and the fourth one by *d;* the sample *c* came from wild olives.

The weight of the ashes of 1 kilogramme of olives is as follows: For *a* 20.77 grammes olives coming from Grasse; for *b*, 17.28 grammes olives coming from Biot; for *c*, 11.82 grammes olives coming from Biot; for *d*, 13.73 grammes olives coming from Biot.

I looked for the phosphoric acid, potash, lime, and magnesia contained in the ashes; the proportions found were:

Mineral substances contained in 1 gramme of olive ashes.

Description.	*a.*	*b.*	*c.*	*d.*
	Gramme.	*Gramme.*	*Gramme.*	*Gramme.*
Carbonic acid (CO^2)	0.140	0.158	0.100	0.128
Phosphoric acid ($Ph.O^5$)	0.072	0.064	....	0.070
Potash (KO)	0.242	0.240	0.188	0.159
Lime (C_aO	Traces.	Traces.	Traces.	Traces.
Magnesia (m. G. o)	Very little.	Very little.	Very little.	0.004

There is then very little magnesia and lime; this, even for the olives grown in calcareous soil, appears to have stopped in the leaves, and not to have gone as far as the fruit. On the other hand, the olives coming from a calcarous soil contain more potash than those grown in siliceous soil; therefore it would be supposable that there is a kind of relation between the acids united to the lime in the leaves and the potash of the fruit; besides the potash appears to have a strong influence on the abundance and quality of the fruit.

I asked myself whether that potash belonged more to the stone than to the fruit. Thirty-seven olives (*a*) kept uninjured for 4 years gave 20 grammes of pulp and as much of stone; the pulp gave 0.596 gramme of ashes containing 0.185 gramme of potash, and the stones 0.482 gramme of ashes containing 0.138 gramme of potash.

The pulp thus contains a very large proportion of potash, and this fact appears to me to have a certain importance; in any case it is rather singular to find at the same time with an oily substance the alkali which apart could saponify it. If we take in 1 gramme of ashes an average of 0.070 gramme of phosphoric acid and 0.200 gramme of potash, we find that in 1 kilogramme of olives there is an average of 18 gramme- of ashes containing 1.3 grammes of phosphoric acid and 3.6 grammes of potash.

CONSUMPTION OF THE OLIVE TREE IN NITROGEN, PHOSPHORIC ACID, AND POTASH.

A hectare of sloping or rolling land may contain 200 middle-sized olive trees, but only 125 on level ground. To calculate the yield an average of 150 of good-sized growth may be taken. The hectare giving on an average per year, 4,500 liters of olives, an olive tree will give 30. It is on an olive tree of this annual produce that we are going to estab-

lish our calculations. The weight of a liter of olives being 600 grammes the above olive tree produces 18 kilogrammes of olives.

Mr. de Gasparin admits that an olive tree loses yearly in leaves half the weight of the crop, say 9 kilogrammes.

Then the wood lost by accident or pruning may be estimated at a minimum of 5 kilogrammes.

The mineral composition of the wood must come near that given by the analyses hereabove indicated. As to the leaves analyzed, as they were still attached to the branches, they contain certainly more phosphoric acid and potash than the fallen leaves. In estimating the loss due to the leaves according to these analyses, a little overstatement will be found; but in the final result it will not amount to enough to note.

The olive tree producing yearly 30 litres of olives will therefore lose—

	Kilos.	Kilos.
In ashes—		
By its stalks	0. 025. 5	= 0. 125
By its leaves	0. 059. 9	= 0. 450
By its fruits	0. 018. 18	= 0. 324
Total		0. 899
In phosphoric acid—		
By its stalks	0. 001. 05	= 0. 005
By its leaves	0. 002. 99	= 0. 026
By its fruits	0. 001. 318	= 0. 023
Total		0. 054
And in potash—		
By its stalks	0. 003. 55	= 0. 018
By its leaves	0. 007. 49	= 0. 067
By its fruits	0. 003. 618	= 0. 065
Total		0. 150

As to nitrogen, according to Mr. de Gasparin, 100 kilogrammes of olives would contain 0.274, leaves 5 per 1,000; granting that the wood of the olive tree contains at least 1 per 100 of nitrogen, as the greatest part of other woods do, it will be found for the loss in nitrogen:

	Kilos.	Kilos.
By the stalks	0. 000. 5	= 0. 050
By the leaves	0. 005. 9	= 0. 046
By the fruits	0. 002. 7418	= 0. 049
Total		0. 145

Therefore the same calculation for 150 olive trees of same production contained in 1 hectare will give:

	Kilos.
In nitrogen	21. 6
In potash	22. 5
In phosphoric acid	8. 1

It is seen by this discussion that the olive tree presents about the same consumption of necessary fertilizing principles as the vine. A part of its roots are spread out near the surface, the other penetrates

deeply when the subsoil is permeable. The olive tree then spreads out upon a cube of ground which may be sometimes very large. This explains how it finds, in the substances surrounding it and when left to itself, the conditions of existence for so long a time, how groves of olive trees may exist for thousands of years, and also how by culture, by a rational manuring, it is possible to assure the duration of that valuable tree and the abundance of its crops during a long period of centuries.

Knowing now the nature and the quantity of the elements drawn from the soil by the olive tree, it is well to look after their restitution by a good manure, the cost of which can be estimated from 100 to 120 francs per hectare.

In restoring all waste to the soil, the crop of the olive tree would not be exhausting it. The elements of oil are especially drawn from the atmosphere and water. What exhausts the soil is the enormous proportion of pulp, stones, wood, and leaves gathered with every crop without restoring the elements taken with them.

When the oil is extracted all residuum goes into industry without any thoughts for the soil which has supplied it. The olive husks, after complete pressing, feed the furnaces of the mills; the pulp is entirely lost, boughs from pruning are burned on the farms, nothing in short of what has composed the crop of the tree returns to the soil.

Agriculturists have for a long time had the custom of manuring almost exclusively with nitrogenous manure. In analyzing the composition and fertilizing value of the residuum of the olive tree, it would seem well to add some manures containing potash and phosphoric acid.

The following is the composition of the ashes of dead twigs coming from the pruning: Ashes of twigs of olive tree, per kilogramme, 270 grammes of coarse fragments (coal, earth, etc.). Per kilogramme of fine ashes: Potash, 55.780 grammes; phosphoric acid, 33.867 grammes. As shown above, Mr. Audoynaud having got per kilogramme of ashes potash 147 grammes, phosphoric acid 33 grammes, it can be concluded from the comparison of the two analyses that the potash disappears progressively in the vegetable organs in proportion as they come near their death.

This is now the composition of the residuum after the extraction of oil: Per kilogramme, water 763 grammes; dry substance, 237 grammes. Per kilogramme of dry substance, ashes 29.1 grammes; nitrogen, 22.2 grammes; potash, 0.3 grammes; phosphoric acid, 1.5 grammes.

According to these analyses the loss represented by not utilizing the ashes of the twigs is rather considerable in potash and phosphoric acid, and the residuum is worth nothing except for the nitrogen and for the organic matter capable of modifying advantageously the physical qualities of the soil. It must not be forgotten that this residuum contains always water and may conduce to maintain moisture at the foot of the trees. But the ashes of the twigs and the residuum are not the only losses

of the olive tree; the olive husks and the fallen leaves must be reckoned. Besides the soil must have its reserve of principle which can be supplied only by special manures as oil cakes, wool rags; they are manures containing nitrogen used periodically in careful culture. It would be well to add wood ashes not leached, sulphate of potash, and chloride of potassium. Finally to complete the restitution it is well to use either excrements or urine diluted in water, bone powder, or phosphate of lime, being manures with a phosphoric-acid base. In appropriating to the application of such manure a sum of 100 francs per hectare, say 75 centimes per tree of good growth, the rules of good culture are followed, and after a few years the soil is supplied again with all the principles extracted by a long series of crops.

Amongst the manures of domestic animals, one of the most active for the culture of olive trees is that from sheep. It is first class manure when phosphate is added. Also to be recommended as cheap and economical manures are: Wool rags, old leather, horsehair, hoofs, bones, and horn scraps.

FORMULÆ OF CHEMICAL MANURES.

The following are some practical formulæ for the composition of chemical manures, to be used for the manure of 1 hectare or of 150 olive trees of good growth:

(1) Applicable to a soil poor in nitrogen: Sulphate of ammonia, 150 kilos; superphosphate of lime at from 30° to 32°, 200 kilos; triturated sesame oil cakes, 6 to 7 per cent. of nitrogen, 400 kilos; unleached ashes, 200 kilos; total, 950 kilos, or, say, from 6 to 7 kilos per tree.

(2) Applicable to a soil poor in potash: Nitrate of potash at 95°, 150 kilos; mineral phosphate in bone powder, 200 kilos; triturated sesame oil cakes, 300 kilos; crude pulverized sulphate of lime, 200 kilos; total, 850 kilos, or, say, 5 to 6 kilos per tree.

(3) Applicable to a soil poor in phosphoric acid: Phosphate of lime at from 30° to 32°, 400 kilos; chloride of potassium, 100 kilos; triturated sesame cakes, 300 kilos; soot, 200 kilos; total, 1,000 kilos, or, say, 6.5 to 7 kilos per tree.

These formulæ can be altered according to the composition of the soil; that composition can be known either by analyses in the laboratory or by analyzing the soil by the trees themselves; that is to say, in dividing the plantation in five nearly equal parts—1, 2, 3, 4, 5—and in manuring No. 1 with a manure without nitrogen, No. 2 with one without potash, No. 3 with one without phosphoric acid, No. 4 with a complete manure, and No. 5 being left to stand as witness of the results. These experiments require, to be useful, to be continued for 5 or 6 years at least, as the atmospheric circumstances have a notable influence on the fruitfulness of the olive tree; serious errors might follow if the experiments were made during 1 or 2 years only. For this reason the

direct analysis in the laboratory is to be preferred; it prevents the loss of time.

Circumstances which have influence on the nature of manures.—When plantations are in the vicinity of towns, near railways, or highways there is often an advantage to use town manures as excrements, industrial products, or dung coming from stables or cow houses in manuring frequently and in small quantities.

When they are far from populous centers and from railways or highways, the preference must be given to wool rags, old leather, horn scraps, horsehair, hoofs, bones, and sheep's manure in manuring abundantly every 4 or 5 years. Commercial chemical manures, as well as olive cakes, which with little weight contain a considerable quantity of useful substances, are also to be recommended when the carriage of the manure is expensive.

Manure with undried plants.—In the plantations far from highways, and of difficult access, the culture around the trees of plants of prompt growth, as broad beans, white lupinus, vetches, Madia sativa, etc., is useful; they are buried undried. They are not very nutritive, but as they take from the atmosphere the greatest part of their nourishment, they do not exhaust the soil of its mineral principles, and, therefore, return more than they take. Their physical influence is considerable; they disintegrate the ground and give to it more permeability; buried during the spring, they maintain, at the foot of the tree during the strong heats, a moisture much more advantageous than the waterings.

Composts.—It is not to be forgotten that the spontaneous vegetation of many untilled lands may abundantly supply plants which, after having been previously crushed by the feet of horses, can be put in water-tight pits, mixed with mold, straw fragments, leaves, lime, ashes, any part of dung or excrements produced on the farm, and give, after fermentation, a compost of a real value, worth much more than its cost price.

Time of manuring.—Manure of a slow decomposition, as wool rags, old leather, horn scraps, horsehair, hoofs, old rubbish, cow-house dung, and composts are advantageously spread in autumn. They receive then the rains of the winter, which facilitate their disintegration, check their fermentation, and render easier assimilation by the roots. The more these manures are disintegrated more is their action beneficial.

As to the very soluble manures, as excrements, dried night soil, poultry excrement, guano, and all commercial manures generally which contain much organic nitrogen, it is better to apply them in winter time.

Finally, the sulphate of ammonia, chloride of potassium, and especially nitrates, manures very soluble in water, are to be spread in preference during the first days of spring.

Mode of spreading manures.—Whatever their nature, manures must be buried over the whole extent of ground occupied by the roots. It

is known that the roots spread all the further from the foot of the tree as the soil is poorer and less deep. Theory as well as practice require, then, the spreading of the manures on a circle, the diameter of which equals the length of the longest horizontal branch of the tree.

The depth to be covered depends upon the nature of the manure. Commercial nitrogenized substances and chemical manures must be much divided, mixed previously with earth, and not deeply covered.

As to composts, wool rags, not decomposed manures, a circular ditch is dug about the tree, 30 or 40 centimeters deep, at a distance from its foot varying with the horizontal length of its branches; in this the manure is placed in layers 5 centimeters thick and covered with the earth taken from the ditch.

It is indispensable not to spread the wool rags in too thick layer, for if the spring was too dry a fermentation might supervene which would raise the temperature of the soil and injure the roots.

Time for manuring.—In considering a biennial crop, which is recommended for the advantage of the agriculturists, the manuring must take place in the course of the winter which precedes the year of production and directly after the pruning; the tree, cleared from its suckers and dead wood, receiving fully air and light, copiously manured, is put in a good condition for producing new wood which will be loaded with fruits the following year.

HARVESTING THE CROP.

The olive tree flowers every year, and there are those who advocate an attempt to gain a yearly crop; but the majority are content to try to get a good crop every two years. The trees bud in May and flower in June.

Olives to be preserved green are picked in September, those destined for oil from November until the following May; but the best results, to crop and tree, seem to follow harvesting near midwinter when the olive is black, though oil made from olives gathered as late as February and March is preferred for its keeping properties. The main reasons for early harvest seem to be that the insects have less chance to propagate, and that new shoots, which are to bear the fruit of the following year, have not started, and are thus safe from injury during harvest.

The farmers in this neighborhood, many of them, spread sheets under the trees and knock the fruit down with poles, injuring fruit and tree in so doing. It is a bad plan, made necessary by neglect of proper pruning.

The harvest is gathered largely by Italian women who come into France for that purpose; they are paid by the quantity gathered, boarding themselves.

OIL MANUFACTURE.

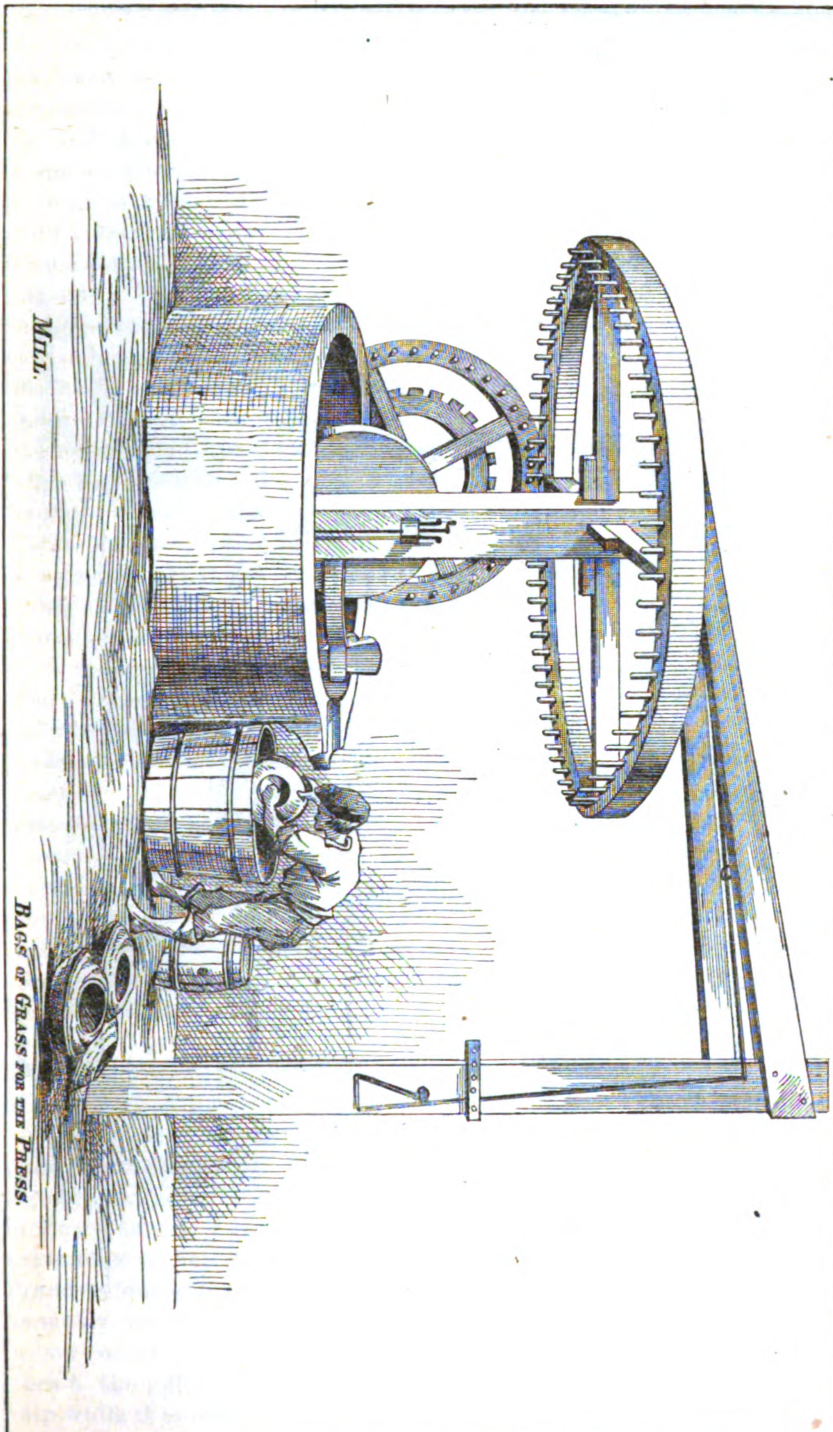
Oil mills.—The olives being gathered, the farmer here either takes them to the mill at once if he sells to the miller by weight, or spreads them in the sun or granary to dry out some of the moisture if they are simply to be ground by weight for his own benefit. The olive seems to lose no oil until the humidity is taken out; but water hot or cold, or still better, oil, must be added to olives too dry, to cause their oil to flow.

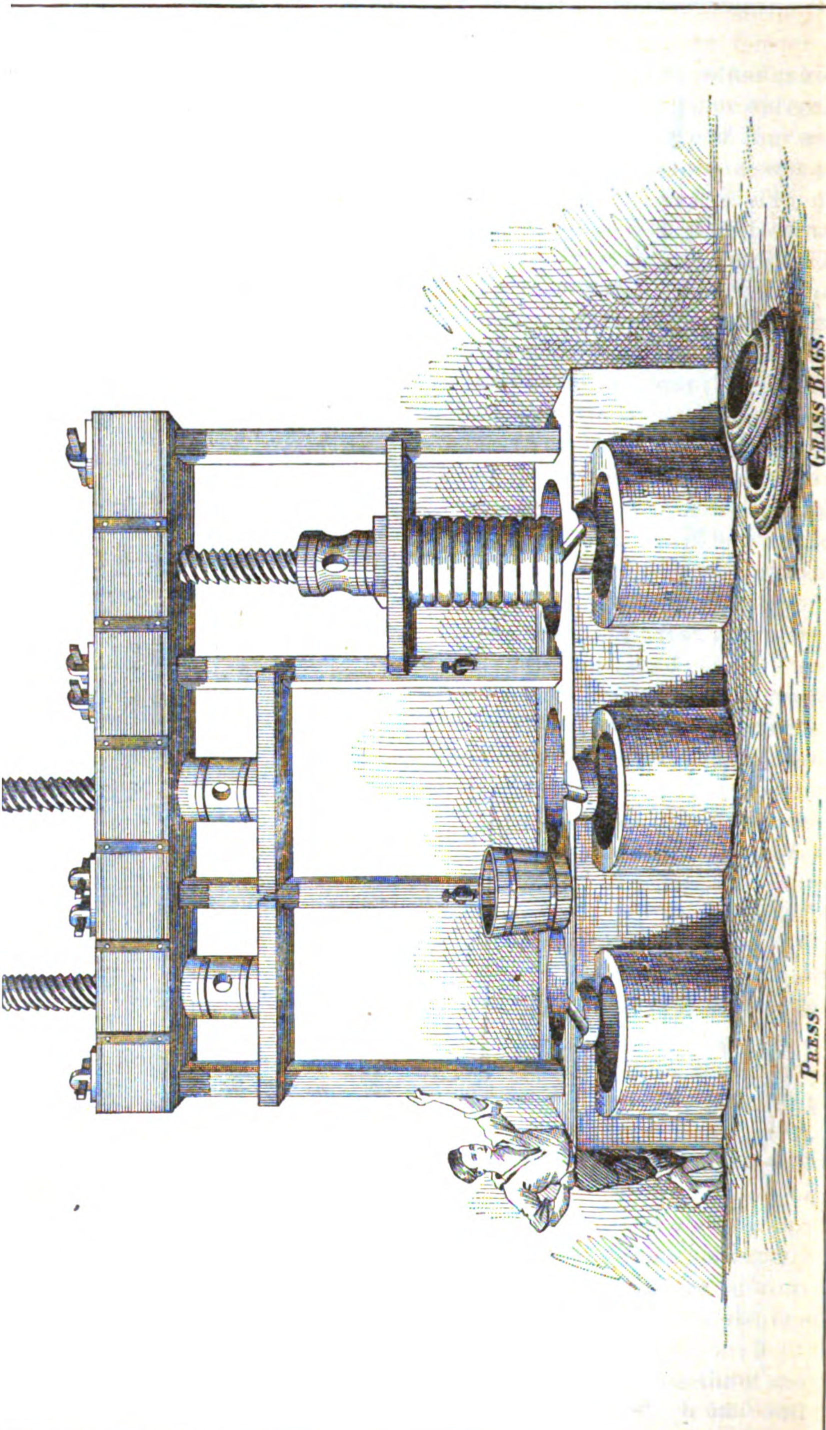
The mill in use to-day to crush the olives differs little from those used for centuries. I visited one near Nice early in November, when the crop was just beginning to arrive (see sketches of the mill); the olives were poured into an enormous stone bowl from the center of which rose a large wooden shaft crowned with a large wheel; in the rim of the wheel, pointed downwards and regularly spaced, were strong oak pegs for cogs; these met similar pegs or cogs in the power wheel, which was turned slowly by an overshot waterwheel; attached to the up right shaft, forming an acute angle with its lower end, was a large millstone exactly the shape of a large grindstone, the edge bevelled to match the slightly concave bottom of the great bowl; from the side of the upright shaft, opposite to the great millstone on the end of a short horizontal shaft, was a scraper which fitted the inner side of the bowl. When the mill starts the olives in the bottom of the bowl are crushed by the stone, those forced up the inner sides of the bowl as the great stone revolves, are scraped off and drop back under the stone until the mass is reduced to an oily paste; this paste shoveled out was packed into flattish-round woven-grass bags, which were taken to the presses; these are simply rough heavy frames fitted with large screw presses worked by hand; the bags are piled up in single piles, like so many cheeses, on the wide oak slab forming the bottom of the frame, the presses are screwed down upon them with a hand bar, exactly as our house-raising tacks are screwed up; the oil drains into tubs placed to receive it, when boiling water is poured over the bags to help the flow, and joins the oil in the tub; the oil rising to the surface of the water is skimmed off with very large tin skimmers.

Mr. Brullé, director of the agronomic station of Nice, has invented a mill which, as it crushes the pulp, extracts the stone and throws it out; this allows, according to Mr. Brullé and other authorities, the oil of the pulp, the true virgin oil, to be obtained from the press without any mixture of that from the stone or kernel.

The people of these warm, olive-raising countries are slow to adopt new ideas, so Mr. Brullé will have to wait some time before seeing his new labor-saving (to say the least) invention supersede the clumsy, old-fashoined methods which are used now, because the ancestors of the people used them.

Virgin oil.—Many people talk about virgin oil, but such a thing can not be found by the ordinary consumer. It requires so much care and


MILL.
BAGS OF GRASS FOR THE PRESS.


GRASS BAGS.
PRESS.

attention to prepare this oil that it is only to be found in the house of a farmer who has a mill and prepares this oil for his own use. Olives are taken when only three-quarters ripe; these are all selected free from any blemish; they are taken immediately after they are gathered to the mill where they are but slightly crushed, so that the pulp alone comes in contact with the millstone; the seed must not be touched, for though the kernel contains a certain quantity of oil, it is, as connoisseurs know, rather acid and has not as fine a taste as the oil from the pulp. This pulp having been crushed without the addition of water, either hot or cold, is gathered in a heap, the center of which is made hollow in the shape of a funnel. The oil flows by itself from the inner sides into the center of the reservoir, from which it is taken with a large ladle. The oil so prepared is greenish in color, its perfume is exquisite and it can be kept for many years.

First-quality oil.—For oil of the first quality, called "cannon oil," the olives are placed in the mill without addition of water if the fruit is freshly gathered. The oily paste is placed in bags made of clean esparto, and submitted to the press. In mills with more modern improvements hydraulic presses are used.

Second-quality oil.—To obtain oil of the second quality, and in order to extract from the pulp all the oil which it contains, they throw the contents of the bags into a vat which is full of cold or warm water; the whole is well stirred up, the broken fragments of the seeds fall to the bottom, while the pulp floats, this is gathered and replaced under the press. Some pour boiling water over the bags the first time they are put under the press; this simplifies the labor, greatly increases the yield, but reduces the quality.

After all the usual means of extracting oil from the pulp have been employed, 10 per cent. of oil can still be obtained by using bisulphide of carbon.

Oil yield.—The best oil is undoubtedly obtained from olives not fully ripe, for too ripe fruit gives oil which is heavy and without perfume. Risso says that 100 kilogrammes of sufficiently ripe and sound olives ought, in a good year, to yield 20 kilogrammes of good oil and 4 kilogrammes of inferior quality, and in bad years only 10 of good oil and 2 of inferior.

Olive refuse.—After the oil is extracted the skins and refuse are employed in heating boilers, the muddy substance found at the bottom of the most inferior quality of oil is used as manure, and last of all the broken stones or "grignons" make a very excellent fuel, which has the advantage of not giving off any carbonic-acid gas as charcoal does. Fraud is found in the oil mills, as everywhere else. Should the olives be moldy, which often happens when they have been gathered or kept in bad condition, the bad taste is hidden by adding leaves of wild olive trees to the pulp. Others even go so far as to throw seed oils over the pulp while it is being ground, so as to get a perfect blending with the new oil

Keeping oil.—To keep oil in good condition needs great care and attention; the clear oil ought to be separated from the turbid at once, for the longer the oil remains on the lees the more apt it is to contract a rancid or a bad odor. When the oil has been decanted several times, as the needs may be, filtered through dry moss, carded cotton, sand, plaster, charcoal, etc., it must be stored in a place which is sheltered both in summer from the heat, and in winter from the cold.

Restoration.—Oil must be kept in vessels, which close tightly, and are made of a substance on which oil has no action; these precautions are indispensable, for the effect of the air on oils is too well known not to be guarded against; they absorb oxygen very rapidly and soon reach a condition which renders them unfit for food. They can be restored nearly to their original state by warming them with the addition of alcohol and washing them afterward, but they become much paler in color, without any strong taste or odor. Limewater in equal proportions can also be used, or 25 centigrammes of caustic potash per kilogramme of oil.

The best way to obtain a lighter color in very dark oils is to mix them with oils which are nearly white.

Oils when exposed to the cold become congealed; a gentle heat will restore them to their original state. On the surface of congealed oils is found an essential oil, which is employed on the pivots of watches by watchmakers.

Proving the oil.—Mr. Brullé, the director of the agricultural station at Nice, has, during the past 2 years, perfected two methods of proving the purity of olive oil as well as the quantity and kind of oil used in adulteration. The first process is a quantitative analysis of which the following is a translation:

PROCESS BY ILLUMINATED NITRIC ACID.

The process consists in submitting the suspected oil to the action of nitrous vapors produced by the action of nitric acid upon dry albumen.

(The cubic centimeter equals a gramme of distilled water.)

Operation.—Take a test tube, put in it 0.1 gramme of albumen powdered, 2 cubic centimeters of nitric acid and 10 cubic centimeters of the oil to be tested; heat gently over the alcohol lamp so that acid and oil keep the same temperature. When the acid boils, incline the tube over the flame in such a way that by the ebullition albumen and oil may be thoroughly mixed; this will be accomplished when a movement of particles is apparent facilitating the dissolving of the particles of albumen which give off shining vapors as they dissolve.

If the oil analyzed is pure olive oil, the color of the mixture is pale yellow with a greenish tinge, while olive oils adulterated with seed oils, (even 5 per cent.), take a clear yellow color which varies from pale golden yellow to orange, and even to red, according to the oil used in adulterating.

To get the best results, after having examined the mixture in its heated state, plunge the test tube into ice water, and in about 2 minutes examine again. When the contents are congealed the traces of the oxidization of the mixture by the nitrous vapors upon the inner side of the tube are more apparent.

The reaction of Mr. Brullé is very sensitive; it permits to detect as little as 5 per cent. of cotton-seed oil in the olive oil; with 5 per cent. of cotton-seed oil the color of the mixture will correspond exactly to 100 parts water, 5 units of Naples yellow, and 5 units of dark chrome.

Given prepared samples of oil with exact amount of adulteration known, it is easy to decide the amount of adulteration in any sample offered with the help of this reaction.

As the proportion of adulterating oil increases, the colors become more intense. Fifty per cent. of cotton-seed oil would give a precipitate of a color to correspond with 100 parts water, 5 units Naples yellow, 5 units chrome yellow, and 5 units of vermilion.

It is to be noted that when other oils, such as sesamum, are joined with the cotton-seed oil in an adulteration, the fraud is as easily detected, but not the amount of cotton-seed oil, as the sesamum oil tends to change the vermilion red to deep orange.

The following mixtures of pure olive oil and 10 per cent. of adulterating oils gave the following results: Olive oil, pale yellow greenish tinge; olive oil, 10 per cent. cotton, vermilion red; olive oil, 10 per cent. groundnut, golden yellow; olive oil, 10 per cent. sesamum, golden yellow, pale; olive oil, 10 per cent. beechnut, dark red; olive oil, 10 per cent. poppy seed, golden yellow pale; olive oil, 10 per cent. nut, yellow orange; olive oil, 10 per cent. cotton and sesamum, dark orange; olive oil, 10 per cent. cotton and groundnut, golden yellow, bright. The observer, by comparison, will readily detect 5 per cent. of adulteration by any of these oils.

SECOND PROCESS.

QUALITATIVE ANALYSIS.

Process based upon the curious effects produced by nitrate of silver upon oil.

Operation.—Treat 10 cubic centimeters of oil with 5 cubic centimeters of nitric acid in a porcelain capsule, heating and shaking thoroughly at the same time until it foams. Different colors are obtained according to the oil used. We pay no attention to this, but letting the capsule cool, we add 5 cubic centimeters of a solution of nitrate of silver (25 per cent.) with alcohol of 90°.

If we continue the heat, then comes a moment, at about 115° C., where the nitrate of silver is suddenly decomposed and deposits the metallic silver upon the inner sides of the capsule. The heat is continued far enough to cause the first luster to disappear, and on tapping

the capsule lightly, we observe on the one hand on the inner sides the color of the thin oily coating, on the other the metallic luster playing on the surface of the liquid. To tell then whether the oil is pure or adulterated we turn to the following table:

Oils.	Colors (natural state).	
	Oily coating.	Metallic luster.
Olive	Olive green	Green.
Cotton	Green	Ash green.
Sesamum	Chrome green	Sevres blue.
Groundnut	Greenish yellow	Emerald green.
Poppyseed	Olive green	Green, light blue.
Camelina	Persian lake	Light blue.
Flaxseed	Dragon's blood	Emerald green.
Rape seed	Persian lake	Cyprus green.

Second operation.—Examination by saponification of the oils. It sometimes happens that by the first operation the kind of oil used in adulterating is not clear; in that case proceed to saponify the mixture.

For this purpose 20 grammes of an alcoholic preparation of caustic potash is dissolved in a larger quantity of 90 per cent. alcohol, not, however, exceeding 100 cubic centimeters. Add 20 cubic centimeters of this solution in a test tube to 10 cubic centimeters of the oil to be tested, shake thoroughly, and heat in a water bath to 92° C., leaving it in the water 20 minutes. Empty the contents of the tube into a porcelain capsule holding say half liter; fill it with boiling water, adding 50 cubic centimeters of a 20 per cent. solution of sulphuric acid.

After shaking decant the acidified water, again add boiling water until, after several decantations, the last traces of sulphuric acid have gone.

Treat the oil thus obtained by the first operation to get a different set of colors as per the following table:

Oils.	Colors (saponified).	
	Oily coating.	Metallic luster.
Olive	Orange of Mars	Cyprus green.
Cotton	Sienna	Cobalt violet.
Sesamum	Golden yellow	Do.
Groundnut	Persian Lake	Light violet.
Poppy seed	Golden ochre	Blue.
Camelina	Dark chrome	Do.
Flaxseed	Black	Green.
Rape seed	Burnt carmine	Ultramarine blue.

In these tables the names of colors are those of water colors, which are the same everywhere.

PRESERVING.

According to location the olives for preserving are generally gathered by hand when they are still green, in September or October, depending on the locality; they are thrown into tubs which are full of water

and in which a certain quantity of soda of salicornia has been dissolved. The salicornia and "salsola" of the Chenopodiaceæ family grow naturally on the Mediterranean coast. When burnt their ashes contain a great quantity of excellent soda, which is used in glass and soap manufactories. These plants can be sown on lands that have been overrun by the sea so as to absorb all the soda the sea has left on the soil. The olives are left in this bath 3 or 4 days, when they soften and at the same time are pickled; then they are placed in small casks with water, salt, and aromatic herbs. The olive is ready for eating when the stone is easily separated from the fruit. Another way to preserve them is to pour over the olives water with ordinary ashes rendered caustic by the addition of a little quicklime; after staying some days in this mixture they are placed in other tubs of clean water, which is changed frequently; to this water is added muriate of soda and aromatic herbs.

When the olives to be preserved are quite ripe the blackest and finest are chosen and exposed to the sun for several days, salt is sprinkled over them, and they are then put in oil.

There are some varieties of olives which when perfectly ripe can be eaten as they are in their natural state.

The olive tree, evergreen, bears its fruit on the wood of the preceding year, and never twice at the same place; sprouts readily from the trunk and becomes a vigorous tree. With rational pruning it gives a regular, abundant, and early crop.

PRUNING.

In regard to pruning, I can not do better than draw largely on Mr. Gos, who seems to agree with the majority of authorities. He says:

"Pruning is most important and requisite; it regulates the production of fruit and improves its quality, making it larger sized and the crop more abundant. The opinions of the agriculturists as to pruning do not agree; some maintain that the olive tree must be sparingly pruned, as it is the small boughs which bear fruit; some say that it wants a vigorous pruning, as it bears its fruit only on the new wood, and that to have new wood it is necessary to prune vigorously; others think that every variety wants a distinct system of pruning. All these opinions have no serious basis, and generally come from special cases. What occasions those differences of opinion is that in practice three distinct cases are present, viz:

(A) Trees never having been pruned.

(B) Trees not having been pruned for a long time.

(C) Trees having always been regularly pruned.

The system of pruning being unchanged, the method of application only is different, and it is well to examine closely the operations necessitated by the above three cases, two of them being, as regard culture, pathological cases, the last one only being a normal case, on which it is possible to study methodically the pruning that the olive tree requires.

(A) Trees never having been pruned: Those trees are of course full of wood; they have many confused branches, few boughs lower down, and very picturesque form, not at all favorable for the production of fruit. In these conditions some abundant crops may be obtained, but they are very irregular; further, the tree is a complicated mass of exhausted branchlets, which are the shelter of numerous parasites. To bring these trees to a regular production some agriculturists would, prune radically, leaving only the stem and the principal branches, but it would be better to pull up the trees or not to prune them at all than to have them submitted to such amputation.

When one wishes to submit an olive tree which has never been pruned to a rational pruning it is well to proceed gradually, and to avoid revolutionary prunings, because in years of dryness or of severe cold the greater part of the trees might be destroyed.

The best method of pruning is as follows:

Cut off the top at a distance from the ground equal to the greatest diameter of the tree; although the sacrifice of the tops is often distressing it must be done, and the branches cut off will soon be succeeded by new ones more productive and in better form.

Clear the inside of the tree, suppress the vertical branches which follow the direction of the stem, take off the dead wood and all that hinders the climbing of the pickers into the tree; let every leafy part receive air and light, which are indispensable to good fructification; suppress the branches too close as well as the unhealthy ones, or those which have not sufficient room to grow; clear the shoots about the tree, spare the branches which hang towards the ground as the branches of the weeping willow do.

This pruning will not bring fruit in the same year; more often it is not until the fourth year that the tree bears fruit; during that time and every spring it will be well to nip off the shoots which would have a tendency to rise above the new top, and during the summer prevent the growth of any suckers, which pruning encourages.

Five or six years after the application of the above pruning the olive tree gets again a regular production, and its fruit is larger sized, earlier, more abundant, and less accessible to parasites; in fact the tree has passed from a wild to a domestic state, and will have to be pruned as the trees having always been regularly pruned.

(B) Trees not having been pruned for a long time. The first needful operation in such plantations is the clearing up of the trees; they generally are too close to each other, and therefore want air and light; their roots steal nourishment from each other, and a multitude of parasites live on their drooping branches; one out of three, sometimes two out of three, must be dug up; the trees left will be in better condition and can be easily brought into good order. After the clearing up, all dead or unhealthy branches are to be cut off, so the tree will live easily, its nutrition not be hindered, and it can have room to spread. After these

two operations the trees will have to be pruned as those having always been regularly pruned.

(C) Trees having always been regularly pruned. The aim of the pruning is:

First, to give to the tree an agreeable shape in accordance with the laws of production of the fruit.

Second, to draw to the extremity of each twig and leaflet the sap which circulates in the plant.

Third, to get large-sized, savory, and early fruits.

Fourth, to save the tree from the dry winds and the rays of the sun.

These aims can not be reached by an irrational pruning; the physiology of the tree must first be studied. Amongst the fruit-bearing trees, some, as the vine, bear their fruit on the wood of the year, some, as the pear and apple tree, bear their fruit only on the old wood; finally there is found, in olive and peach trees in particular, a form of intermediate vegetation. Mr. Riondet says on this head:

A branchlet appears this year and is covered with fruit next year; the part which has given flowers and fruit will not again do so, but it can grow for some years until it is fully exhausted and be succeeded by a new branchlet, which grows at its base. The pruning of the peach tree, based on the principle of the annual substitution of a new branchlet on the old one, was brought to remarkable perfection in the environs of Paris and especially at Montreuil; any form you may desire can be given to the peach tree, and, in the hands of a skilled gardener, all branches stand every year completely filled with flowers and fruit. The branchlets of the preceding year blossom and bear fruit; but a careful nipping prevents their becoming wood boughs, and brings forward the formation of a new branchlet for the following year; in this way the peach tree is always provided with new boughs and may, during many years, give regular and abundant crops.

The olive tree has just the same form of vegetation as the peach tree, with the sole difference that it easily puts forth new branchlets on its old wood, and this is sufficient to explain the short life of the uncultivated peach tree, while the olive tree is almost imperishable. It is well always to bear in mind that the olive tree blossoms only on the wood of the preceding year, but that it can, always and from all sides, put forth new branchlets.

After having applied the common principles of pruning, sharp pruning on the side of the strongest growth, light pruning and vertical cutting on the weaker side to preserve proper proportion among the branches, after having hindered the spreading of the suckers, and after having suppressed them when some have sprouted; after having cleansed the interior of the tree by clearing it of the too abundant shoots, and thus secured the free circulation of air and the action of the sun in all parts of the tree, it is not good to apply the radical pruning spoken of above.

Mr. Riondet says:

The pruning of the olive tree is only the clearing of the tree of the branchlets which, after having grown during several years, and after having successively borne fruit on all parts, begin to be exhausted and to dry up.

The trees are to be pruned after the crop; they put forth then new branchlets which, the following year, will give flowers and fruit; in the course of spring and summer the shoots are to be cut off and the vertical branches of the top nipped off if possible. Is the olive tree to be pruned often? A yearly pruning will give a yearly crop; after the crop (the fruit being as much as possible picked by hand and not knocked down with a pole) all boughs which have borne fruit are to be nipped; new branchlets will grow, but this will not hinder the tree ripening its fruit; a well-cultivated and well-manured tree may have at the same time the power of giving nourishment to the fruit grown on the branchlets of the preceding year and of producing new branchlets, or of letting the old ones grow longer to prepare the crop of the following year. However, a biennial pruning is to be preferred; it is true that it only brings a biennial crop; but it has for effect the suppressing, one year out of two (as we shall see further), of the means of existence of the most destroying parasite of the tree, the Dacus oleæ. Furthermore, even if that parasite did not exist, it would be rational and especially economical to have one year destined to the production of wood and the following year to the production of fruit.

What is the shape to be given to the olive trees? The goblet shape is the most simple and the easiest to be formed and kept up; it is applicable to all varieties of trees; it allows air, light, and heat to circulate among the branches, reduces the work of pruning and facilitates the gathering; where the trees have a tendency to grow too large, it is well when they are young to commence the goblet form in order to maintain proper proportions.

Lower and drooping branches must not be cut off, as they give fruit abundantly when they receive air and sunlight; to cut them off would be a loss, for the lowest parts of the tree are the most fruitful, more easily reached at harvest time.

Proper means to regulate the production of the olive trees.—The trees being well tilled, no other plants cultivated between the rows, a careful pruning of the older twigs after the harvest every two years should be sufficient to keep them in vigorous bearing.

Recapitulation in the order of questions supplied by the State Department:

1. The verdale and lucques are suggested among many for preserving.

2. The cailletier and nirvana are probably as good as any for oil.

3. Names and descriptions are given on sheets 2 and 3 of manuscript.

4. The trees above mentioned are grown within a hundred miles of the sea, and from the shore to at least 2,000 feet above the sea level, on hilly and rolling ground, exposed to the southern sun where possible.

5. The questions of climatic influence were quite fully treated in the portion of the report devoted to oranges and lemons.

6. There is no regular system of irrigation.

7. Cultivation by hoe or plow several times a year. Sheet 3 of manuscript.

8. Vigorous pruning beneficial; keep the tree low and of goblet shape. Sheets 25–28 of manuscript.

9. Harvest for oil is gathered from November to May. The earlier the better. For pickling green, in September or October. Sheets 16–25 of manuscript.

10. Trees begin to fruit at from 4 to 5 years.

11. Average yield per tree may be placed at 30 quarts. Sheet 9 of manuscript.

12. Trees should be planted 40 to 50 feet apart. Sheet 3 of manuscript.

13. The tree is propagated as any common fruit tree. Sheet 3 of manuscript.

15. See Bibliography.

16. For account of all the latest researches on insects see the portion of report on the Enemies and Friends of the Tree. The chief malady, the "Morpée," was minutely described in the portion of report referring to oranges. (See Fruit Culture in Foreign Countries.)

ENEMIES OF THE OLIVE TREE.

There is no tree known to have more enemies than the olive; they attack the wood, the blossom, the leaves, and the fruit.

These foes do not include the cold and the fogs, both of which are very injurious to this sensitive plant; great drought and warm winds are also detrimental to its welfare. The olive tree has to bear the attacks of certain mammifers, certain small birds, and insects of nearly every description.

(1) Mammifers.

In certain localities young trees must be guarded against the teeth of rabbits and against cattle. The field mice (*Mus sylvaticus*), are great consumers of olives; but as they only attack fallen fruit, which ought to be considered as unfit for oil, I consider them as very trifling culprits.

(2) Birds.

Among birds of medium size there are some which feed on the olive itself; these are the thrush (*Turdus musicus*), the black bird (*Turdus merula*), the starling (*Sturnus vulgaris*), the magpie (*Pica melanoleuca*); others feed on the almond or kernel; the *Coccothraustes vulgaris*, and the *Loxia curvirostra*. One can say that birds in general are fond of olives; but as the appetite of the smaller kinds, such as the warbler, the robin red breast, figeaters, the wren, etc., is very quickly satisfied, and as they devour a much greater quantity of insects than fruit, one should class them among the friends of the olive tree.

The thrush and the black bird consume a very large quantity of olives; there are certain parts of the country in autumn where these birds literally swarm; they seek among the olive trees their resting-place for the night, and before roosting they partake of their evening meal; this operation they do not perform in silence, far from it, for from far away one can hear their noisy chatter; it is to these birds that we are indebted for the wild olive tree which grows in the forests; they are therefore of some utility; but can this be compared to the enormous damage they do? I do not think so; therefore the farmer who comes with his gun to disturb the feast of these devastators can not be blamed.

The *Coccothraustes vulgaris* and the *Loxia curvirostra*, which must not be confounded one with the other, both belong to the families of

sparrows and conirostres. Both are birds of passage, which rest wherever they find abundant food; they emigrate towards the Mediterranean about the month of November; they are heavy stubby birds of the size of a large sparrow; they have great strength in their claws and in their beaks; they use them for opening pine cones and the stones of other fruits so as to get at the kernel; both these birds are prejudicial to the olive harvest in this sense, that they attack the fruit in order to get at the stone, out of which they extract the kernel; the *Coccothraustes vulgaris* specially is very wasteful, for every olive which he may eat he plucks fifty; therefore one can not declare too severe war against them; they are easily distinguished from other birds by their size and by their call, which is not very shrill.

The starling ravages the olive trees that are in the neighborhood of marshes. Lastly, the magpie, which is almost unknown in the Alpes Maritimes, eats olives wherever found.

(3) Insects.

I have said before that the olive tree has to fear nearly all insects; among the Hymenoptera, the ants (*Cremastogaster scutellaris* and *Camponotus pubescens*). Among the Coleoptera, *Phlœotribus oleæ*, or Neïron; *Hylasinus fraxini; Cionus fraxini; Peritelus Schœnherri*, and *Cremissi; Othiorhynchur meridionalis; Ghilianii* and *oleæ; Apion galactitis*, and others of the same species, etc. Among the Neuroptera: The *Termite Calotermas flavicollis.* Among the Hemiptera: *Phlœothrips oleæ* of Targioni (or black worm or Barbau); *Euphyllura oleæ* or *Psylla oleæ*, and several cochineals (*Lecanium oleæ, Aspidiotus villosus, Mytilaspis flava, Pollinia costæ, Philippia folliculuris*), etc.

Among the Lepidoptera: *Pray's oleellus* or miner caterpillar is really dangerous; *Margarodes unionalis*, the caterpillar of which is dangerous for shoots and for the graftings; *Zelleria, oleastrella Boarmia umbrasia, Metrocampa honoraria.* These three last species attack more particularly the wild olive trees.

Among the Diptera: *Dacus oleæ*, or Keïron. The list is a long one; I shall start with the

Hymenoptera Ants.

(1) *Cremastogaster scutellaris.*—I had at first, after reading Laure, placed that ant essentially southern among the friends of the olive-trees, but since arguing the point very seriously with two of my colleagues of the entomological society, I have been forced to alter my opinion, and obliged to bring down this insect from the pedestal on which I was disposed to let it remain.

One of these colleagues was kind enough to give me a description of the *Cremastogaster scutellaris* taken from nature; I will now render his account, which I am, to my great regret, obliged to curtail:

The head of the male insect is round and short; the mandibles are large; the maxillary palpi are of 5 articulations; labial palpi of 3; antennæ of 12; the thorax is rather compressed; it is armed with two thorns, which diverge a little; the first articulation of the petiole is flat; the second is nodiform and hollow above a longitudinal groove, rather deep, which divides it in two parts; the abdomen is united to the petiole, not by its fore side as in most of the other ants, but by its antero, superior part, which is nearly heart-shaped; generally this insect is black and the head bright-red, the leg brownish red; sometimes the thorax and the petioles are also red; length 3 to 5 milimetres.

These cremastogasters advance in a file along the olive trees, carob trees, and other trees. Laure says that they are in search of the scars that the Dacus has made in the olives in order to deposit its eggs; the former is hunting for these eggs. It is certain that this ant has an object in wandering over the trunk and leaves of the olive tree; but it is not at all proved that these insects are any help against the invasions of the Dacus, for the female of this dipteran, when depositing her eggs in the olive, makes an insignificant wound in the fruit, and the larva is too deeply sunken in the latter for it to be possible to be got at by the ant. The cremastogaster could, if it were in any way carnivorous, attack the fly when, still weak, it leaves the olive.

It is far more likely that they are hunting for cochineals peculiar to the olive trees, not to destroy them, but to utilize them for their own benefit. This is what this insect does, according to the opinion of Mr. Ernest André, who has made a special study of the ant: The *Cremastogaster scutellaris*, says he, is far from frequenting specially the olive tree; it is found on other trees of entirely different natures; its object is to look for the plant-louse and the cochineals, of which it delights to suck the liquid dejections. The case described by Laure is void of any foundation, and quite contrary to what is known about the habits of the ant.

The visits which the cremastogaster pays to the wounded olives are simply to suck the juice which may by chance run out, for it is proved that the ant cannot mastigate its food.

One of my colleagues goes further and says that the ants not only furrow galleries under the bark of trees which are detrimental to them, but carry their love for the plant-louse and the cochineal so far as to pick them up from the soil where they may have fallen accidentally, and carry them back to the tree where they find their food.

It is therefore useful to look after the nests of the cremastogaster under the trees or under their bark, and to destroy them when found.

(2) *Camponotus pubescens.*—It is a large black ant which abounds on the trees attacked by the Morfée; this insect evidently comes to lick the Lecanium oleas. The camponotus seems to live in good understanding with the cremastogaster.

COLEOPTERA.

(1) *Chlosotribus oleæ.*—This insect is a Coleopter, of the ravaging family of the Xylophagans, and is known in these regions by the local names of Neïroun, Neïron, Courcoussoun, Babarotte, Chareuçon; in Italy it goes by the name of *Tunteruolo dell'olivo.* This is its scientific description: Length, 2 millimetres; of blackish tint, covered with a greyish down; the head is indented; the mandibles are projecting; the face is flattened and finely dotted; the antennæ are in proportionate length with the size of the insect; the last articulation is divided in three leaves of unequal size, having the shape of a rake, of reddish tint, and bristled with hairs of a special type, showing their connection with the great family of Lamellicorus; the body is convex, narrower in the fore part than the hind, round on the sides; clytra convex, very dotted, ornamented with 10 very prominent striæ, bristling with red hairs; the body is thick set; the legs are brown. The Phlœotribus has under its elytra membranous wings which it uses readily. This insect is considered after the Dacus or Keïron, of which I will speak later, the most injurious insect to the olive harvest. It attacks the tree itself while the Keïron attacks only the fruit. It not only does harm to the tree by injuring and weakening its fruit-producing branches, but by the shelter which its abandoned holes give to the Phlœothrips or black worm, in which the latter deposits its eggs and where it goes through its various transformations; therefore every one ought to do all that is possible to destroy them entirely.

In 1826 Professor Risso mentions, without giving any detail, an insect which he denominates "*Cionus destructor;*" it seems to me to be the same *Phlœotribus oleæ.* In 1843 the engineer Bertrand mentions three insects which must have some analogy with the Phlœotribus; the Scarabee of the olive-tree which attacks only dead wood, which seems to be the "Apate sex-dentata," of which I will not say anything now; the "Bostriche," which is the Hylesinus; and lastly the "Vrillette" of the olive tree, which seems to me to be no other than the Phlœotribus for the very reason of the characteristic division of the enlargement of its antennæ in three branches. The author adds that the larva nourishes itself on the alburnum of the tree and lives on the small branches which it kills. In 1848 Bompar of Draguignan gives more ample details than his predecessors; he exposes the errors made by Amouroux and Bernard, and makes mistakes himself by stating that the Phlœotribus is born and lives on the olive tree, that it rarely flies, and that it feeds rather on the dry wood of the olive tree than on its young and tender shoots. He even goes so far as to say that it might very well originate from the sap when in fermentation in the wood separated from the tree, and ends by putting this singular question: "Is the germ ambient?"

Dr. Martineng, of Grasse, published in 1863 and 1864 two reports on

the Neïron, in which he gives a summary of the very judicious remarks of Mr. Bernard, proprietor at Chateauneuf. I have read with a great deal of care Mr. Martineng's notes and have compared his with mine and have arrived at the conclusion that Mr. Bertrand was correct, and what great service his observations might have been to the agriculturists had they only been followed! The following is an analysis of the reports of Dr. Martineng showing wherein our observations differ:

There is not a single olive farmer who does not know, or who has not observed that small insect, the size of a millet seed, which measures but 1 millimetre from its head to its abdomen, burrowing to deposit its eggs under the bark of the branches which have been cut off in pruning at the end of the winter or early spring. These branches are in a very short time pierced all over with small holes, rendered noticeable by a yellowish dust, which is thrown out by the insect while establishing its interior galleries.

Mr. Martineng continues: The branches preferred by the Neïron are those of medium size, where the bark is soft and thick and preserves for a longer time than the smaller ones moisture sufficient for the development of the eggs. It is easy to observe that the eggs deposited in too small branches do not mature.

It has been noticed that the insect only attacks the branches which have been pruned between January and July, for branches cut off after this period and placed in the same conditions as those pruned in the spring are not covered with Neïron.

That observation, which in my opinion is open to discussion, has certainly one use, viz, to show the advantage or disadvantage of keeping the branches which have been cut off anywhere near the olive-tree plantations, also what is the proper period for pruning the trees.

Messrs. Bernard and Martineng divide the existence of the Neiron in two very distinct phases, the laying of the eggs in the newly-cut branches and the damages caused to the tree itself. It gnaws the soft bark that surrounds the young shoots which bear the next year's harvest, and very often perforates through and through the young branches; it seems to select the angle formed by two shoots, choosing generally the part opposed to the direction of the rain and avoiding the north exposure; its galleries are not deep and it abandons them willingly to go and form others in the vicinity.

The Neïron lives all the year round on the olive tree, except at the time of laying its eggs, in the boughs cut off in pruning. This operation begins at the end of the winter and lasts 45 to 50 days, sometimes till the month of June. It is very likely that the parents die as soon as they have secured a shelter for their progeny.

Mr. Bertrand was of opinion that the female insect produced the larva directly itself, but Mr. Martineng has corrected this error.

It is useless to explain at length that the female Phlœotribus, being fecundated, deposits its eggs in small recesses, often very numerous, which both insects, male and female, have excavated in the galleries they have tunneled, and that these eggs are covered over with the dust of the wood, which they resemble in color and size. It is for this reason that they have escaped Mr. Bernard's observation.

One can see, adds Mr. Martineng, the young larva start, on leaving its birth place, to perforate the branch in its length, piercing galleries in a line more or less perpendicular to those made by its parents. By the middle of July all larvæ have changed into Neïrons, and one only finds in the branches either dead or imperfect larvæ.

As soon as the insect is perfect it perforates the bark from within, escapes to the trees, and commences its ravages.

Are these ravages real? Can they be attributed to the Neïron? Messrs. Bertrand and Martineng say so, and I, for my part, certify that I have observed them many times and have shown their work to many agriculturists, who only notice the loss of their olives year by year due to the Keïron or Dacus, but take no measures to protect their trees from this real danger threatening them.

It is the Neïron, continues Mr. Martineng, which undermines the young shoots and causes them to dry up and fall. Does this insect lay its eggs on the live tree? That point has not yet been solved, adds the doctor.

Nearly all authors seem to agree that there is only one generation of Phlœotribus oleæ per annum, and that that generation takes birth exclusively on the wood that has been cut down; hundreds of these insects have died in my glass cases after having lived in them for weeks, and after having caused very visible damage to the young olive branches placed with them. As I said, these insects died without sexual connection, and therefore without having prepared a second generation. In my observations I have not noticed on the branches of young trees the trace of secondary galleries indicating the work of the larva; we can not perhaps conclude from this that the insect hatched in June or July and which has gone through its different metamorphoses in 50 or 60 days, only remains until the following spring before satisfying the laws of procreation. Bernard, Campanio, Bompar, and others admit of several annual generations, and the following I translate from the "Annales d'Agriculture" of Florence, published in 1879. It is the most thoughtful and recent document which I have found on this subject:

The honorable Baron G. Ricasoli sent in 1877 from Valdarno and from the province of Sienna, to the entomological society of Florence, and this society also received in 1878 (April 20) of the agricultural meeting of Perouse, young olive branches in which were confined a few female insects of the first generation of the *Phlœotribus oleæ* (*Punteruolo dell olivo*), engaged in perforating their galleries and in depositing the eggs of their summer generation, so fatal to the branches that bear blossom, and so preparing for a third and fourth generation to create havoc in the harvest of the following year.

There can, therefore, be in the course of a year several generations of Phlœotribus oleæ, either in the wood that has been cut off or on the branches which have been attacked on the tree. This would show the necessity of fighting against the most important of these generations, the best proven in my opinion, the one found on the wood cut off in pruning which we have at hand, and which offers us a way, if not of destroying the enemy completely, at least of reducing its numbers materially.

Mr. Companio, of Perpignan, is the only one to my knowledge who has spoken of a parasite of Phlœotribus oleæ, which he describes under the name of Locusta arachnoïda (arachnoid grasshopper), and of which he gives a rather singular illustration; it is possible that in the "Pyrenées Orientales" the Phlœotribus has a parasite, or rather an enemy; but though I have made numerous researches I have failed to find anything similar in these regions.

From what I have said it is certain that when the pruning season comes, viz, the end of the winter or in the spring, one must separate in two lots the cut wood of medium size and the small branches, which must contain more or less Phlœotrips, Cochineals, Psylles, of which I will speak later; these ought to be burnt at once, and the larger branches and limbs, which must be thoroughly investigated so as to find out whether the Neïron has attacked them. Twenty days after, when one can have sure proof that the larva is living and working, the best thing is to burn all this wood that has served as a trap, or if one wishes to keep the wood, one ought to singe it well and take off the bark, or to leave it for several days under water, then dry it and place same in a dry place, hermetically closed, and as far as possible from any olive plantation. If the limbs cut off be burned, it is advisable to do so at night, as in so doing one has a chance of destroying many moths and Tineidæ which are detrimental to the olive tree.

As for the wood which is cut from July to the winter, the small branches particularly are full of living Phlœotribus and Hylesinus, many Phlœotrips and caterpillars also, and must be burned immediately; but one can use the larger wood which does not, at this time of the year, serve as nests; it is nevertheless advisable to look it over from time to time should it be in vicinity of any olive plantation. Personally I should like this wood treated in the way above mentioned.

Mr. Martineng, who arrived at conclusions very similar to my own, ends his report by a remark made by Mr. Funel de Clausonne, chairman of the Society of Agriculture of Nice:

> Many persons, says Mr. Funel de Clausonne, appear surprised to see the Neïron leave the living tree to attack the branch which has been separated from it. The Neïron lays its eggs in the spring when the trees are turgid with sap. It could not work and lay its microscopic eggs in the living bark where the current of sap was in constant motion ascending and descending.

The damage caused by the Neïron to the olive trees was known imperfectly by the mayor of Pelissanne, for in 1857 this magistrate, acting in accordance with the laws of 1831 and 1837, made decree in order to fight the ravages caused by the insect named by him "Barbarotte." He ordered the immediate removal of all cut wood into a far-away shed, or the same to be burnt. This measure, though incomplete, showed, it is said, very good results.

In 1878 the Society of Agriculture of Nice gave, in its pamphlet entitled "The wood of the olive tree," excellent advice to the oil farmers

I have one objection to make; that is, they recommend the immediate removal of the wood which has been cut off; by leaving for 20 days or so the heavier wood where it fell, the purpose in my opinion would be better attained.

The *Phlœotribus oleæ* or Neïron is therefore a coleopteran, a relation of the weevils, it is true, but belonging to the family of the Xylophagans, while the Thrips, or Phlœothrips, called in these regions black worm, or "Barbau," is a Hemipter Thysanopter; they are insects of size, shape, nature, and habits essentially different; their only similitude is their propensity to injure the olive trees.

Hylesinus fraxini.—The *Hylesinus fraxini* seems not to be very well known by agriculturists in general, who mistakes it for the Phlœotribus, or Neïron. It has been little studied by authors who have wrongly described its mode of living and the damages it causes to the olive tree.

It is said that this coleopteran causes its ravages while still in the state of larva, that the female whilst pregnant chooses a branch upon which it deposits its progeny, which can be detected by reddish or greenish-gray spots which appear where the attack has taken place. My observations, on the contrary, show that the Hylesinus behaves in a manner very similar in every way to the Phlœotribus. It is at the end of the winter or early spring that the Hylesinus follows the Phlœotribus onto the cut wood; like the latter, it operates in couples; but while the Phlœotribus attacks the medium-sized branches, the Hylesinus chooses the heavy wood as being more fit to protect its larva, and makes its hole generally in the rough parts, more often near the spot where the previous year a branch has been cut off, where the wood is dead. The couple or pair work in a manner identical to that of the Phlœotribus and deposit, like it, their eggs in cells arranged along galleries; the larva works lengthways of the wood; when matured into a perfect insect it regains the living tree, where it forms galleries, which have not a very great depth, and chooses the spot where the young branches are attached to the tree, thus causing their decay.

The Hylesinus fraxini is less thick-set than the Phlœotribus, less dark and more varied in color; its elytra are longer than their width and have 6 striæ. Its principal distinction from the Phlœotribus is that its size is double that of the other, and that its antennæ, instead of being terminated in three unequal branches like a rake, are ended by a mace in the shape of a heart. The larva is in proportion for size with the insect; it is curled in half circle, larger in the fore than after part, apodal, whity and regularly wrinkled, while that of the Phlocotribus is much smaller in size, deformed, irregular, and with a large head.

The ways of destroying this insect are the same as those recommended for the Phlœotribus, and as this insect chooses from preference the rough and dead parts it is advisable to cut off as far as possible these refuges from the living tree; therefore, in keeping not only the trunk but the

branches in a very clean state one will be able to destroy a great quantity, not only of Phlœotribus and Hylesinus, but also of Phlœothrips; of this latter I will speak later on.

The result of my observations is that the Hylesinus is to the Phlœotribus in number and proportion as 1 is to 10; but as it is twice the size of the latter, and as its wounds to the living tree are in proportion to its size, it may be considered as very injurious.

Cionus fraxini.—The olive tree has still in the family of Coleoptera another enemy all the more dangerous as it only attacks the shoots which would bear fruit, the young trees, and the grafts, which it rapidly strips of their leaves.

I was able to study all the transformations of a curculionida which in the state of a perfect insect, as well as when a larva, caused in 1865 and 1866 in Nice and its neighborhood real injury to the young olive trees. This insect, which was the Cionus fraxini, appears in April after having most likely spent the winter under the bark, and deposits its eggs on the leaves of the shoots, or of the young trees.

The larva is yellowish, sticky, attacks the white of the leaf, the under part, which it eats in irregular spots without touching the bright green surface.

After 10 or 12 days this larva has attained its full maturity; it selects a leaf and, uniting under itself the two extremities of its body, forms itself into a ball, loses its yellowish tint, its stickiness, turns to a gray color, then white, dries up and becomes transparent. After 24 hours one can only notice a perfectly oval-shaped shell, in which the larva, deprived of its coat, spins freely; one can see it (with the assistance of its mandibles) thickening, rounding, and polishing its abode, which takes an amber tint; it has accomplished these transformations by coating its body with a slimy substance which is excreted by a retractable nipple situated on the upper part of the terminal segment of its abdomen; this substance allows the insect to attach itself to the leaves or to protect itself from the rain or sun. When in the state of a nymph it takes a rest, and prepares itself for its last transformation, which takes 8 or 10 days; then the insect perforates its shell with the aid of its rostrum, cutting an exactly spherical segment.

Then the Cionus spreads on the leaves, which it devours in the same way as the larva, or on the edges; they pair, then fly to the summit of young trees, which they prefer. Here is the scientific description of the *Cionus fraxini:* Centennæ, tawny; proboscis, or trunk, cylindrical and curved, brown at its basis, black at extremity; head, grayish-brown, with the upper part blackish; corselet narrower than the elytra, of a brownish-gray, with upper part blackish; elytra of a whity gray, with small striæ not very distinct, dotted with brown and gray; sometimes there is a large black spot alike on both elytra, which extends from the base to the center; under part of the body covered with dark-gray scales; feet tawny; thighs dentated on the under side.

The male is smaller than the female, its rostrum is shorter; the markings on the elytra vary much in both sexes; as soon as hatched they seek one another and commence mating, which is not the habit of the Phlœotribus nor the *Hylesinus fraxini.*

It is in its perfect insect state that this one of the curculionidæ causes the most damage; its appetite not only leads it to devour the leaves upon which it walks from end to end, making a mark a millimetre wide, but it digs its rostrum into the soft and tender shoots, which are full of sap, making wounds which infallibly cause the loss of both flower and fruit which their shoots were to bear. I have noticed that from April till the end of July there might be two seasons of laying, and that the first was always deposited on the young shoots or grafts; the best way I can suggest to fight against this enemy is to shake the young shoots over an open umbrella, reversed so that by the shaking the insect would fall in the receptacle thus prepared; the leaves could also be examined, when it is easy to detect the larva in the act of preparing its abode for the purpose of its various transformations. The larvæ of the Cionus fraxini are attacked by several species of Hymenoptera; the larva, stung by the Hymenopter, depositary of its enemy's egg, continues its existence and becomes food for the parasites, which transform themselves into a small chrysalis, of a metallic black color, admirable in shape. Of 10 cocoons, 5 have given birth to Hymenoptera.

Peritelus Schœnherri.—This coleopteran belongs essentially to the south ,and is of the family of the Curculionidæ; it attacks the young shoots, in the center of which it settles itself; its transformations take place in the ground, and it is most likely also in the earth that its larva finds its food, either on the roots of the olive tree or of some other plants. The fact is that I never found this larva on the tree, but in May the perfect insect is often found on the young shoots which wither under its attacks. The *Peritelus schœnherri* is a pretty insect, silvery gray, of slender form, and is in size a little larger than the Cionus. The following is its scientific description:

The case of the prothorax and elytra cut square (this is the distinctive sign of the species); shield-shaped spot dark; size regular, about 5 to 6 millimeters long; color, silvery gray, with sometimes a yellow or bronze hue, which forms a darker longitudinal band upon the elytra; rostrum short, as long as the head; antennæ gray, pubescent, oval, terminated in a point; prothorax cylindrical, slightly depressed on the upper side; elytra slender, oval, cut square at the case, terminating in a point, nearly flat on the back, convex toward the end, which turns down; striæ fine distinctly dotted; legs small; forelegs ending in hooks rounded on outer edge; female slightly convex underneath.

The relative large size of this insect, its silvery color striking against the tender green of the shoots make its capture easy; it can be caught by hand or by shaking young shoots and grafts over an open umbrella.

Peritelus cremieri, more numerous than the preceding, like it, but smaller, plumper, less silvery; rostrum thick and a little longer than the

head. *Othiorhynchus ghilianii* (Fairmaire) and *Othiorhynchus Oleæ* are mentioned as hurtful to the olive in Italy; but they have not been seen in the south of France.

Othiorhynchus meridionalis.—Bompart mentions the *Othiorhynchus meridionalis* as injurious to the olive tree. The head is long in shape, antennæ elbowed, body black and hard; at Toulon it bears the name of "chaplum." This insect is nocturnal, performs its different transformations at the foot of the tree, and feeds on the leaves and young wood; it must be looked for in the daytime at the foot of the tree; it abounds at Flyères, but is less commonly found in the Alpes Maritimes.

Oryctes grypus.—Another Coleopteran of strong build, the *Oryctes grypus*, of the family of the Lamellicorns, called by Bompart Rhinoceros or Engraitto galinos, is harmless when it has become perfect; the only time it may be (for it has been proven) injurious to the olive tree is when it is in the state of larva; for being deposited amongst the roots it may gnaw them. The way to fight against this insect is to spread soot at the foot of the trees, which at the same time acts as manure, or in burying oil lees, which are a deadly poison to insects.

Vesperus strepens.—This insect is sometimes accused of injuring the roots of the olive trees when in a state of larva, but the fact needs proof, although the perfect insect is often found on the olive trees.

CANTHARIS VESICATORIA (Linnéu).

Bompart classes the Cantharis amongst the insects which are injurious to the olive tree. He says that it attacks the leaves in April and May. It is not to be wondered at that the Cantharis seeks the olive tree when it can not find any ash or lilac trees, which are its natural food and of the same botanical family. This insect, in my opinion, is not a very serious enemy of the olive tree.

Companyo, of Perpignon, speaks of a *Vesperus sex-pustulatus* of the family of Longicorns, which lives in olive wood; as it appears that this insect is very rare, it can not be very dangerous.

The same would be the fact concerning the *Agrpnus carbonarius* of the family of the Elateridæ, which is black,. velvety, speckled with silvery white spots. This insect is also mentioned by Compayno.

NEUROPTERA.

Colotermes flavicolis—One of my colleagues of Amelie les Bains informed me that he had discovered a termite (is it the *Colotermes flavicolis?*) reducing to dust the trunks of olive trees which though old still showed signs of life. As the olive tree still gives a crop even when it appears only to have its bark left, it is of the highest importance to destroy this insect, which though it attacks the dead parts of the tree is certainly not without injury to the living wood.

The means to be employed for its destruction are boiling water and fire, only both remedies must be applied with great care.

HEMIPTERA.

Phlœothrips oleæ (Targioni) *Thrips oleæ* (Costa.)

My chapter on the thrips was ready when I first learned of a series of reports by Haliday, who, struck by the marked characteristics of these insects, has considered them as forming a particular order, and has denominated them Thysanoptera, which he has divided into two families; the Tubulifers and the Terebrantes. Our black Hemiptera homoptera will therefore be a *Thysanopter tubulifer*, as it has a borer in the shape of a tube, and we ourselves will call it *Phlœothrips oleæ*, name which Targioni has given it.

This being established, we will continue our original undertaking.

In 1826 Risso spoke of a black Staphylinus (*Staphylinus lugubris*), which might very well be our Phlœothrips of the olive tree.

In 1834 Passerini published in Florence a memoir, in which he states that he had found thrips in their different transformations on the olive-tree leaves in the neighborhood of Pietrasanta; he also noticed that many buds contained from 4 to 5 eggs, that the larvae were fixed to the under part of the leaves, in order to take their nourishment from their parenchyma. Then from the spring to the autumn many generations saw life. To this Hemiptera the learned Italian had given the name of *Thrip phacœsaphus* (Linneus).

In 1846 Mazzarosa, in a book which he published on agriculture in general in the providence of Lucques, says that at the beginning of the century many olive trees of the locality were infested from May to August by thrips which caused great havoc amongst the young fruit and leaves. Over 6,000 trees were affected by this scourge; the damage done was so enormous that the terror stricken agriculturists abandoned the trees which were affected; some nevertheless tried remedies, principally pruning, from which process they derived some benefit.

In 1848 Bompar, of Draguignan, who is the first French naturalist who has spoken at any length of a thrips without however designating its species, considers it as an enemy of the olive tree.

He is of opinion that this insect lays eggs twice a year, in April and in September, at the summit of the shoots at the top of the tree in the small holes which have been made by the Phlœotripus or Neïron, or in those it perforates for itself. This Hemiptera caused great ravages in 1603, 1820, 1836, in the neighborhood of Draguignan. The thrips, adds Bompar, finds its nourishment in the sugar or sap of tender leaves or buds, which it literally perforates with thousands of small holes. The trees that are thus attacked only give fruit on the lower branches. The largest part of the harm is in June, July, and Aúgust. In 1863 and 1864 Dr. Martineng, of Grasse, gives far more precise indications on this insect. The thrips, which is called black worm in the district of Grasse, and Barban on the left bank of the Var, lives during the winter months under the bark and the dead leaves, but chooses in preference the gal-

leries abandoned by the Neïron, and selects those that are the most sheltered.

During the fine season this insect circulates on the trunk and on the leaves; the female makes use of the galleries made by the Nüroun and deposits its eggs in them; it is proved that this insect attacks the young fruit, and the farmers believe that it poisons all with which it has had any contact. I have gathered a few of these insects from Falicon and the Mantega localities which unfortunately are attacked; this has placed me in a position to study, describe, and sketch them. My description which follows agrees with that of the Italian Naturalist Targioni Tozzetti: Length, 2 to 3 millimeters. The body is all a brilliant pitch black, has six legs; the head is as wide as deep, rounded in the forepart, eyes large, with facets; antennæ have 9 articulations and are as long as half the length of the body, inserted on the front of the head, the first and last articulations black, the others pitch color, on the last articulation a few black hairs; the prothorax is nearly hexagonal; 4 membraneous wings are attached very high on the shoulders and are fixed two by two folding themselves on the body so as to reach beyond the abdomen; these wings are very transparent, reddish, narrow, rounded at their extremities, garnished with long, black hairs; each wing resembles a feather; the legs are black and short; it has two tarses, one terminated by an air hole thickly garnished with fine hairs; both are armed with hooks; the abdomen is black, has 9 segments dark pitch color on the junction of the rings; it is terminated in both sexes by a tube or borer garnished with hairs at its extremity. I do not know what distinction there is between the male and female. This insect, before reaching the perfect state described above, undergoes two transformations which are characterized by a lighter color and the absence of wings.

Among the remedies used against these insects are whitewashing the trunk and larger branches, fumigation of tobacco and sulphur, washes of boiling water, and plenty of manure to strengthen the growth; but as the evil is generally on some one tree, or even parts of a tree, the most effective means of combating it is vigorous pruning, with the precaution of burning all the leaves and branches pruned, not forgetting to keep the tree in good condition.

FALSE PUCERONS.

Psylla—Euphyllura oleæ (Foerster, 1848), called Araneum by Pliny, Bumbacella Ragnatella in Italy, Pulgilla in Spain.

I give here the description given by B. de Fonscolombe of this insect, which he calls false puceron or cotton of the flowers:

Its larva, says this learned naturalist, produces the cotton which surrounds the olive bloom, and hides itself under this cotton which it has secreted; the perfect insect appears in July, and then frequents the olive tree, either for its food or for the purpose of laying its eggs, while the larva and its nest appear when the buds begin to

develop; the false Puceron in its full maturity is only the length of one line; its color is a greenish yellow; its forehead, prominent and flat, has the shape of a shield; the antennæ are longer than the head, filiform at extremities; the corselet is transversal and very narrow; the elytra are nearly square, widening at the outside of the base, and are rounded at their extremities, white and of a clouded transparency, spotted here and there with reddish stains, with two black points in centre of inner side; the wings are white and transparent; the abdomen is conical; the anus of the female appears to be armed with two long united triangular blades, which must assist her in laying or placing its eggs; the trunk lies along the breast; the legs are rather thick; the thighs are enlarged to club shape, to enable the insect to jump.

The larvæ and nymphæ resemble, with the exception of the wings, the perfect insect, but they are of a paler green.

The description of the insect in its perfect state is correct, but that of the larvæ and nymphæ is not so satisfactory; besides, nothing is said of the habits of the Euphyllura. Mr. Bernard, the engineer, as early as 1848, says it is a false Puceron, resembling very much a small grasshopper, which attacks in great numbers the twigs and stems of the leaves, producing a loss of sap injurious to the tree. Its length is one line, with four transparent wings; antennæ are filiform; the proboscis is visible, the abdomen greenish, terminating in a point; yellowish legs; very seldom flies; if disturbed it walks sideways, and jumps with grea ease. They gather in company at the axilla of the leaves and round the petiole, under a cottony covering which Pliny calls a cobweb. It secretes from the anus a honey-like substance, sweet-tasting, which gathers in drops, and which might very well be the Elsomeli of the ancients.

Bompar, in his account of the false Pucerons, says that they are very small insects, with large heads, stumpy bodies, protruding eyes. The larva, he says, has six legs. They lay twice a year—once in April, then in September. This insect attacks the young shoots, which it very soon destroys. It is called "Sauteret" (Tumper) at Grasse, because of its facility in jumping, and Blanquet (Whitey) in Toulon, because of the color of its wrapper. Since 1848 many people have studied this interesting family of insects. It has been shown that the larva has two phases in its existence, and that the nympha had all the activity of the perfect insect, with the exception of jumping and flying.

These are my own observations: The larvæ and nymphæ move about under a cottony covering which is milky white and a little shiny at its basis; the perfect insect keeps away from this substance, which it secretes no more. If the inhabitants of this white abode are in any way disturbed, one sees bristly white balls exit with precipitation and crawl along the branches; freeing these living balls of some of their outer covering matter, one easily distinguishes thick-set larvæ of a yellow-red tint, with thick, black antennæ; the body is flat shield shape and carried by six slender legs with black extremities. No apparent sign of elytra; the body is covered with long white threads of great tenuity; at the extremity of the body there is an apparatus of a darker

tint from which escape lumps of cotton; in the midst of the larvæ is found drops of a slimy liquid which has been produced by them.

So much for the larvæ; as for the nympha, it resembles already the perfect insect in shape, and specially in its greenish color; it has less cotton about it than the larva; but still has the apparatus which terminates the abdomen; on each side of the thorax can be noticed rudiments of elytra of a brownish red, very short, and standing out from the body; the nympha, like the larva, lifts its abdomen in moving forward. Independently of the abundant sweating which the Psylla causes with its proboscis, says Bompar, it must, to a certain extent, injure the clusters of fruit; besides, as the flowers are surrounded by a slimy substance, they grow with difficulty, and dampness and dew gather about and cling to them.

The agriculturists are glad to have a moderate wind blowing during the blooming season, so that it may carry away the cotton left by the psylla and free the flowers.

The olive trees should be examined and the flowers and young fruit which show signs of the invasion be burned. This operation offers no difficulty, as the branches attacked are generally those nearest the ground. When the flower has fallen and the fruit grown the psylla spins its cotton lower on the tree at the axilla of young leaves, especially on young shoots or grafts. They can be detected under their white covering, perforating holes which must be detrimental to the growth of the tree. There is a small green spider, marked with black lines, which kills quantities of the false pucerons.

COCHINEALS.

Lecanium oleæ; Aspidiotus villosus; Mytilaspis flava; Pollinia costæ; Philippia follicularis.

One can safely say that if the cochineals have been utilized by industry they are generally detrimental to agriculture; that is to say, that nearly every species of trees harbors several species, which by their number, their frightful fecundity, and their incessant voracity exhaust the plants on which they live.

In the south of France, where the cochineals abound, says Mr. Signoret, many kinds of trees, amongst them olive, orange, and fig, are covered with black, which, on examination, proves to be a fungoid growth called "Fumagine," growing on coatings of the dejection of Coccus and Lecanium, seriously injuring the tree. Of all trees the olive tree is preferred by the cochineals of different species, amongst which can be mentioned: The *Lecanium oleæ* (Bernard-Signoret); the *Aspidiotus villosus* (Targioni); the *Mytilaspis flava* (Targioni); the *Pollinia costæ* (Targioni); the *Philippia oleæ* (Costa). The characteristic and general distinction of the cochineals is the nonexistence of a beak or rostrum in the male and the absence of wings or elytra in the female.

Lecanium oleæ (Bernard).—This cochineal is detrimental to the olive tree, not only by absorbing the saccharine substances of the young shoots and leaves, but also by the result of the spread of these saccharine matters, or by its excretions, which give rise to the birth of a cryptogamous plant, which is no other than the "Morphee" or "Fumagine," of which I shall speak later.

This insect is particular to the olive tree, and is even sometimes in such abundance that it invades the surrounding trees. The *Lecanium oleæ*, says Mr. Signoret, is rough, of a blackish brown, sometimes of a yellowish gray, has the shape of a rounded oval, rather pointed towards its extremity; its antennæ are large and have eight articulations.

The embryonic larva has only six articulations to the antennæ. The male of the *Lecanium oleæ* has never been discovered. At the period of laying, the female, then the size of a lentil, of a brownish red, places itself on a branch, contracts itself into a convex shape, and gives birth to more than 1,000 eggs; there are two layings a year. This cochineal was the object of a notice by Mr. Pablo Colvei; he called it the *Aspidiotus oleæ*. His notice was published in Madrid in 1880, in an edition with engravings.

Colonel Goureau, in his work published in 1859 on injurious insects, already at that date spoke of a cochineal, called by him *Coccus oleæ*. It is said in this work that this gall insect, real plague in the Var, was not known at Aix, and does not alarm Provence to any degree. All agree as to the part played by the said cochineal, which infects certain olive trees and exhausts them by constant stings, which cause an injurious loss of sap; this sap, with the very abundant dejections of the insect itself, facilitates the growth of "Morfee" or "Fumagine." The following species of cochineals are also found on the olive trees, but are not as injurious as the one above:

Aspidiotus villosus (Targioni).—This species was discovered by Targioni on the olive trees of Florence. He has only described the female, which is gray, covered with hairs, and of a cottony substance. The male, according to Mr. Signoret, is a yellowish red.

Mytilaspis flava (Targioni).—This cochineal is found mixed up with the *Pollinia costæ*, with which it must not be confounded; the female is covered with a gray dust, which renders its detection difficult, as it is the same color as the bark of the tree. The last segment presents five thread plates. The male is smaller and nearly yellow.

Pollinia costæ (Targioni).—Color, yellowish brown; shape, a rounded oval covered by a thick film formed by a whity secretion, more or less regular, which adheres quite firmly to the tree; but in which the insect is perfectly free.

These small masses, says Mr. Signoret, are sometimes aglomerated in a considerable heap resembling a white exudation of the sap of the tree; this cochineal was plentiful in Cannes on the olive shoots in 1870; it has no legs and rudimentary antennæ; the male is long, the abdomen large, the head wider than long; antennæ have nine articulations.

Philippia follicularis (Targioni), *Oleæ* (Costa).—This species forms a white bag, very voluminous, which is secreted by the female and deposited on the under part of the leaves; the antennæ have six articulations in all its transformations; the body is covered by a multitude of small hairs, the dorsal part particularly. Male unknown.

No other way is known for their destruction than to give plenty of vigor to the tree, keep it from constant moisture, kill the cochineals and destroy their nests with injections or lotions of water and vinegar or petroleum.

LEPIDOPTERA.

Certain Lepidoptera or butterflies can also be classed amongst the enemies of the olive tree.

Here are two reports sent in 1837 by Mr. B. de Fonscolombe to the French Entomological Society. The author says that there are two Tineidæ particularly injurious to the olive tree; one attacks the leaves and the other the fruit.

Tinea oleella (B. de Fonscolombe). *Chenille mineuse* (Dray's oleellus).—A small caterpillar with sixteen legs of a greenish brown, with black jaw, black scaly plate on back of neck, and another on the last rings of the body; has no hairs, yellow head, causes heavy damage in the Var and the County of Nice. It is seen in winter working between the two thicknesses of the leaves, or in March, towards the end of its existence, wrapping itself up in a few silk threads between the shoots and young branches along the tenderest twigs. This caterpillar, two lines long, transforms itself towards April into a chrysalis of oblong shape, the color of which is a yellowish green; it is found amongst the silky threads I have just mentioned, or in the cracks of the branches; the butterfly comes to light about the end of April; its wings are wrapped round its body; its antennæ are filiform, nearly as long as the insect itself; its trunk is small, its head scaly, its body of an ashy gray; its wings are long, marbled with black tints; the abdomen is yellow, with grey hairs, which forms a tuft towards the arms; its antennæ and legs are gray, the latter are armed with a spear which facilitates the jumping.

Tinea olivella (B. de F.).—This caterpillar lodges itself in the kernel of the olive in the same way as others do in the apples, cherries, etc. The egg which produces it must be deposited by the female on the blossom when the fruit is forming itself. It penetrates in the stone, which is still tender, and lives there until the time for its transformation has arrived, in September, when it perforates the stone at its only vulnerable spot; that is, where the fruit is attached to the stalk; then issuing from the fruit, it lets itself drop on the ground, where it undergoes its transformations. The fruit thus pierced falls at the least wind. This caterpillar is larger than the Tinea oleella; the chrysalis is yellow, the wings coverings a little brownish. The insect which comes out of it resembles very much the first described. This one, however, is larger. Bernard, of Marseilles, in his memoirs of 1872, thought there was only one species, which lived in the stone in the first generation, and on the leaves in the second.

B. de Fonscolombe combats this opinion on account of the characteristic difference of the two caterpillars, and on the impossibility of admitting that the same insect should feed itself on the mealy and at the same time oily substance of the kernel and on the cellular tissue of the leaf. Anyhow, many learned men, amongst whom are Duponchel,

Millière, and Stainton, who all have carefully studied the question of microlepidoptera, have come to the conclusion, notwithstanding the many reasons to believe the contrary, that there only exists one sole and same insect which they call the *Pray's oleellus*. Stainton, an English lepidopterist, has given satisfactory evidence that the two species were one and the same. B. de Fonscolombe, too, 14 years after his statement as above, admits of his error in his circular to the Entomological Society of France of 1851.

I can certify that the result of the breeding of the caterpillars that I obtained either from fallen fruit, from leaves or young sprouts in March and April, was that I obtained the same Tineidæ color iron grey, wings rolled up. I can also certify that amongst the numerous caterpillars which come out of stones, the largest, the deepest in color (wine lees tint), transformed themselves immediately; but that the smallest and youngest ones did not in any way hesitate to feed upon the olive tree leaves that I gave them.

There is, therefore, only one same and identical species of these caterpillars having annually two generations in different circumstances and conditions, observation which is very interesting to study. The caterpillar is greenish, spotted here and there on the back, with stains, color of wine lees; the chrysalis is either green or brownish yellow; the butterfly, which sees light in September, is iron grey with fringed wings, the upper ones being spotted with black, the under ones plain.

Coming to the means of destroying this insect, B. de Fonscolombe shows with reason that in Provence, where the trees are small, it is easy to detect and burn the leaves which are attacked by their yellowish brown irregular spots, which harbor the caterpillar; but this process of detection becomes far more difficult in the Var., and especially in the Alpes Maritimes, where the olive tree attains such large dimensions. Good advice to the oil cultivators is to light up at night large fires in the olive gardens in March, August, September, and October; any amount of Tineidæ, will come and burn themselves in the flame; another way is to stretch out at night time ropes coated with honey; the best way, however, is to frequently turn over the soil at the foot of the olive trees and not to let the fallen olives lie in September, for nearly all these olives have been detached from the tree by the work of the boring caterpillar, which has eaten away the base of the stalk so as to escape from the fruit and reach the ground, where it undergoes its transformations; these olives should be picked up before they dry, and as they do not yet contain sufficient oil to be used advantageously, the best thing to do with them is to burn or destroy them immediately. One can easily see what would result from leaving them by placing a few handfuls of the olives, showing the work of the insects in a bag; after one night quiet, large numbers of the caterpillars will have come out and can be seen making, on the inner sides of the sack, light cocoons in which to shelter their chrysalis.

Margarodes unionalis.—This pyralis deposits its whitish eggs at the axilla of the smaller branches; they are hatched 15 or 20 days after. The young caterpillar attacks the inferior part of the leaves at night-time; in the daytime they shelter themselves between two leaves that they have united by means of threads. The Margarodes take 5 or 6 weeks to develop itself, then it retires into the crevices of the bark where it undergoes its transformations.

The butterfly, which measures $0^{m}.0025$ to 0.0027^{m}, has white antennæ, large silky white transparent wings, without lines, of a pure white, iridescent in the newly born, the upper ones have the sides of a reddish brown; the thorax and abdomen are white; the female is larger than the male.

This is the only specimen which we possess in Europe of this remarkable and numerous species. The unionalis is plentiful in Provence, specially at Cannes, where it attacks particularly the olive and jasmine trees.

Lelleria oleastrella (Millière).—Caterpillar of a spindle shape, of a green, more or less dark, with longitudinal lines; the head, testaceous, is yellow. It lives on the *olea europosa*, but principally on the non-grafted tree; it attacks the new leaves, on which it settles and eats their underparts; after its third molting it retires into a spun tunnel in the crevices of the bark which it only leaves at night to feed; its liveliness is remarkable. The chrysalis is of a brownish red; the hatching takes place a fortnight after the metamorphosis. Dimensions $0^{m}.0021$ to 0.0022^{m}; the upper wings of the butterfly are long, narrow, rectangular, and of an earthly appearance like the thorax and abdomen; the under wings are darkish gray, shining and garnished with long silky gray fringes; antennæ are filiform, brown, as long as the body; the head is white, the eyes are large and black; it can be caught at night, but not easily.

Boarmia umbraria (Millière).—The shape of the caterpillar of this species is cylindrical, of a brownish gray; it may be mistaken for the Rhomboidaria. It falls plentifully in the sheets that are spread under the trees when they are shaken for the harvest in February and March. The perfect insect is very noticeable. The male and female differ only by their size; in the female the antennæ are comb-shape. It has two hatchings a year, one in June and another in September. The caterpillar is quite common, the butterfly rare; the latter is sometimes taken at night with a light. This insect is not very dangerous to the olive tree, for it attacks only the old leaves of the large trees.

Metrocampa honoraria.—The caterpillar of this species shows on each of its middle segments a sort of projecting ring of a whitey-gray tint, varying from a violet to a reddish hue; it has twelve legs, eleven segments; frequents the olive tree, on which it takes its winter quarters stretched along its branches; it falls in the sheets at the time of harvesting when the trees are shaken. The chrysalis is a reddish brown. It is hatched in May and October, and is very prolific. The female is

larger than the male. The butterfly, flesh-colored, comes readily to the light; it is one of the largest of European Phalæna. It is also found on oak trees.

Acherontia atropos.—The caterpillar, which has two hatchings, one in April, the other in September, lives on the *Lycium barbarum* and *Europœum*, the *Datura stramonium*, the *Ligustrum vulgare*, and the *Tasminium fructicans;* it has also been found on the *Quercus robur.*

Sphynx ligustri.—The caterpillar lives from July to September on the privet, the lilac, and the pink laurel; it can therefore also live on the olive tree, which is of the same botanical family. Anyhow both the caterpillars of these two butterflies are too large not to be detected, their habits being, too, to settle on the lower branches in reach of eye and hand.

DIPTERANS.

Dacus oleæ (Latr.).—Of all the enemies of the olive tree the one that principally occupies the minds of cultivators at present is a fly called scientifically the *Dacus oleæ*, and for immemorial times bears the names of Gueïron, Keïroun, or Keïron, given it by the cultivators of the olive tree.

The *Dacus oleæ* is an insect of the Dipterans family, which is characterized by the existence of two wings, having behind them two other wings, movable, rudimentary, and useless for flight; they are called balancers.

The Dipterans have for a mouth a sucker composed of many scaly pieces, which are inclosed in a sort of trunk.

Blanchard has divided the Dipterans into two classes—the "Menioceres," comprising the Culex or gnats and the Tipulæ; the Brachoceres, comprising the "Musciens," of the family of the "Athericeres," amongst which he places "Tephrites," which he again subdivides into the Dacus and the Tephritis.

The general characteristics of the Dacus of Meigen and Macquart, the Oscinis of Fabricius, the Tephritis of Latreille, are as follows:

Palps enlarged; the antennæ reaching the epistoma, with the third articulation three times as long as the preceding one; the style bare, the abdomen oval.

Dacus oleæ, of which I give description below, is the type of the genus: Length 2 lines (0.005 milimeters); body yellowish gray, tint of head paler, having a black spot on each side of face; eyes grayish blue; front of face tawny; antennæ tawny, with large brown pallets, furnished with a simple hair or bristle; thorax gray, spotted, and a little pubescent, with black longitudinal lines; anterior sides tawny, posterior sides black; escutcheon large and whitey; abdomen oval and blackish, spotted, pubescent, with a yellow longitudinal band which widens towards the anus and forms a transversal band which occupies nearly all the penultimate segment; it is terminated in a point in the females with a pro-

jecting oviduct; its extremity in the male is blunt; wings transparent, always in motion, with yellow veins towards the exterior side, their summit marked by an obscure stain; legs and feet yellow, with the extremity of the posterior ones slightly brown.

Larva apodal, length 5 to 6 millimeters, and resembling a worm; head not very distinct, pointed, retractible, with black mandibles; a third longer than the chrysalis; of a yellowish white; body wings a little projecting.

The chrysalis is in shape like a small barrel of 0.004 milimeter of length and is only the skin of the larva hardened, shortened, and regularized in its shape; it is a perfect oval, yellowish, with the line of the rings of a darker color.

In the year 1826 Professor Risso, of Nice, in the second volume of his Natural History, says, speaking of the *Tephritis oleæ* or Keïron, that he considers this insect as very dangerous to the olive tree. In his opinion the Tephritis comes in swarms towards the end of the summer and deposits two or three eggs in each olive; the larvæ, when hatched, suck all the oily substance out of the fruit.

The olive [says Boyer de Fonscolombe] is very apt, at the time of its maturity, to be attacked by the larva of a dipteran of the muscides family, which is perhaps the bitterest enemy the olive tree has; it lodges itself in the very pulp of the fruit, and one very often finds two, three, and even more larva in one olive; these often forsake the fruit they have attacked before its complete maturity; they then appear in the form of flies, and reproduce themselves the same season by a new deposit of eggs. It is principally at the time of the gathering of the olives that they leave the fruit, especially when it is stored for a time before being ground: they transform themselves into chrysalides in the dust and dirt; the heat changes them in a few days into flies, these linger for some time round those heaps in a state of torpor and await in this state the return of fine weather.

He continues:

This plague seems to me sufficiently bad to encourage in every possible way the prevention of the birth of these insects, and it is important to burn all dust and dirt in storerooms as soon as the olives are taken away; even before. By these means the chrysalides will be destroyed, as well as the flies before the latter have had time to fly away in order to deposit new eggs on the trees.

A few fine days during the winter months suffice to encourage these insects to seek the open air.

Fonscolombe adds:

While looking over the gathered olives some days after the harvest I invariably found larvæ, nymphæ, or insects at the same time in their perfect state. I collected a few nymphæ, and taking them away from the heat placed them in glass vases in a cool place. These nymphæ only became flies late in the spring. This insect does not reduce the quantity of olives; but it spoils the quality, for the olive and the oil it contains are tainted by the flesh of the larva, as the mill crushes all—the olive, the larva, and its excrements; nevertheless, the oil made in 1817 was of excellent quality, though the number of olives attacked that year by this insect was considerable. On the other hand, in 1834 the crop was nearly entirely destroyed, and the small quantity of oil made was nothing but mud These variations can be attributed to the difference in temperature, which may favor or hasten more or less the birth of these flies before harvest time.

I know very well [continues the author] that the precautions above indicated, though they be founded on the habits of these insects, will appear difficult or inadequate in countries where the making of oil lasts all the winter, as in Nice and its surroundings, but then the heaps of olives will have to be carefully watched, especially during midwinter, whenever the temperature, becoming more genial, would tempt the flies to the open air.

The method I would advocate to destroy the worms and flies would be to close up all the openings into the storerooms where the olives are kept, and to put in the room a few robin redbreasts, wagtails, tomtits; these birds willingly seek shelter during the winter months, are tame by nature, and as their food consists principally of insects they would give chase to the *Dacus oleæ*.

This system is practiced in other countries to destroy the weevil in the corn sheds; in my opinion it would answer the same purpose in this case. It will, of course, be necessary to keep water within reach of the birds.

Many different plans have been suggested, but after what has been said previously the best and perhaps the surest way of all is good culture, great care of the trees, and not to sow any crops around them, so as not to weaken them. It has been noticed that insects always select trees that are stunted and have suffered from the effects of frost; it seems as if the strong sap of the healthy specimen did not suit them, and were even detrimental to them.

This advice given by such a careful observer is undoubtedly excellent; many may criticise it, some may find the application if not impossible at least difficult; it is anyhow very sad to think that the question of the *Dacus oleæ*, which was so well treated at the end of the last century by both Bernard and Amouroux, which was again carefully studied in 1840, more than 40 years ago, has not given the results that one would expect in 1890; our olive crops are more than ever threatened by the simple negligence of those most interested in the harvest of the olive trees.

In 1840 Cauvin, doctor in charge of the hospital at Nice, published on the *Dacus oleæ* or Keïron, to which insect he still gives the name of "Tephrite," a very interesting and conscientious work, which he completed in 1842.

The fly, says this author, begins its devastating work at the end of July, seeking out then the olives, to the care of which it will intrust its eggs, leaving unnoticed the *Oliva conditiva* or "Doncinére," the skin of this olive offering too strong a resistance to its auger.

The apode larva with eleven rings, without eyes, and armed with two hooks (mandibles) auxiliaries to the mouth, penetrates into the fruit as far as the stone, burrowing round it to its place of entrance; it remains thus for a fortnight, forms itself into a chrysalis, and then into a perfect insect.

Should the fruit in which the larva has taken its abode fall to the ground or be gathered, it abandons it, for the fruit is no longer sustained by the sap of the tree, and then completes its transformations somewhere else.

In his second book Cauvin gives the result of eleven experiments as follows: In his opinion the fly ceases laying eggs in November, and the insects hatched in March are the result of eggs laid in the autumn, it needs

a frost of 8° Reaumur to kill the larva, and 12° to kill the germs of the eggs; the flies can be kept for 9 and 10 months under glass by feeding them with a sirupy liquid, or still better with grapes or squashed raisins; the larva can only be kept alive with olive pulp; the adult larva taken from one fruit to another will die unless it be on the eve of its transformation; the larva or even its chrysalis will die if put in water or left in the open; the female lays as many as ten eggs in a day and can perform this duty for several days; the best way to ascertain the exact moment for gathering the olives is to fill a small bag of the fruit in April, to visit them a week after and to continue watching them; when it is noticeable that the larva abandons the fruit for its transformation, then is the time to gather the crop. In acting in this way for several consecutive years there will, says the author, be a chance of destroying the insect.

This conclusion may appear a little too affirmative; but Cauvin's two memoirs are drawn up with such great care, and supported by so many proofs that one may place confidence in them and utilize his recommendations at least in part.

Cauvin in the end of his second volume confutes and exposes the opinions of his predecessors.

Sieuve, of Marseilles, and after him Amouroux, of the same city, were wrong in stating that the fly deposited its eggs under the bark of the trees.

It appears impossible that these authors could have been familiar with the larva, for had they examined it minutely they would have been aware that the larva being apodal and very flabby could not possibly leave its cradle to go and attack the olive trees. What may have led them into error is that in the olives which are freed from the larva two holes are found which may have been considered as the inlet and outlet of the insect when they only indicate that the fruit had been inhabited by two insects.

Sieuve has made many mistakes; he does not speak of a miner caterpillar but he mentions a worm with a proboscis which is unshapely, thin, elongated, whitish in color; this worm uses two claws to form a breach in the olive; the ant is very fond of this insect; it tears open the olive, forces the worm out of the fruit, and devours it.

The worm remains 3 months in the bark, the chrysalis for a month remains in a state of torpor, the fly is hatched at about the 15th of December, its food is the gum of the olive tree (on this point alone I agree with Sieuve), the female lays her eggs in the cracks of the bark, the apodal larva hatched in May waits under the leaves the favorable moment to attack the olive tree; we ask in vain where Sieuve could have found these indications. Bernard, the laureate of 1782, finds no other remedy for this plague than to trust to Providence.

Penchienati advised the gathering of the crop in November or December; this precaution seems rather exaggerated, but is anyhow justified up to a certain point.

Risso alone gave the real remedy: Early gathering of the crops, great care and attention to be bestowed on sheds where the gathered fruit is kept, with burning of all sweepings.

In 1843 Mr. Bernard, the engineer, gives very exact information concerning the natural history of the Dacus, of which he does not know the scientific name, but describes the insect perfectly. He says: This fly which appears in August becomes plentiful by the end of September and in October. He admits that there are several generations.

At the same period as Bernard, Louis Roulandi, of Nice, describes the Keïron or *Musca oleæ;* in his opinion this insect has three or four generations annually from August to December; he gives the chrysalis a fortnight to develop itself into a fly; under 10° Reaumur of temperature the insect remains in a state of torpor awaiting the spring to revive; the Keïron attacks at first the early trees which generally have but little fruit; the Pignole of Villefranche, Monaco, La Turlie are spared by it. During the coupling, which lasts an hour, the female seeks the fertilization of her eggs in the body of the male by means of her borer; the great time for multiplication is September. A few olives left on the tree late in the spring will bring on an invasion. If at the end of March there is not a single olive on the trees, there will not be any appearance of Keïron.

It has been shown that certain naturalists, who studied the Dacus at the end of the last century, were mistaken in the most important question of all, the laying of the eggs.

In a very interesting book published in 1845 on the insects which attack the olive tree, Guérin-Menneville discusses the opinion given in 1834 by Laure, and since adopted by other authors, that is, that the Dacus attacks the olive in the autumn, and that it has a first hatching on other plants; this false idea arose from this fact, that Laure had sent to Boyer de Fonscolombe a fly which had originated from a larva found on some cereal, without mentioning where he had gathered it. Boyer de Fonscolombe knowing that his colleague was occupying himself with the study of insects detrimental to the olive tree returned the fly stating, that, in his opinion, it was one belonging to the olive tree. It is easily understood that simple agriculturists as Laure and Bland were received this as gospel truth, and turned into a certainty this simple supposition of one of the masters of science who had been called upon to give his opinion at a distance without having before him the necessary data.

This error could also be explained by the fact that the Dacus had previously been a Tephritis, and that Fabricius had made it an Oscinis; now the *Oscinis lineata* of Fabricius lives in the state of larva to the great detriment of rye; and Linneus places the fly (Frit) amongst the Oscines and taxes it with having destroyed in Sweden the tenth part of the barley crop.

Guérin-Menneville advises the early gathering of olives, and to crush

them as soon as gathered in the years that the fruit has been infested by the Dacus. In operating in this way you still can obtain half the usual yield of oil, while if you waited for the usual time of harvesting the larva has time to eat up the flesh of the olive, and with it the oil which would have been saved had the fruit been gathered earlier.

Lastly, in 1878, Dr. Maurice Girard, in his catalogue of animals useful and harmful, shares Guérin-Menneville's opinion with respect to early gathering; he believes in three generations of flies per annum, and says that the fruit attacked ripens sooner than that untouched.

I have thus given a faithful analysis of the different works that have been published during the last century on the different enemies of the olive; I have shown that the insects which destroy our olive crops have been carefully studied, and that for many years past perfectly sound advice has been given, advice which unfortunately has not been followed by the agriculturists. I take the liberty of giving now my opinion.

I give it only after having gathered the most numerous and precise information from the olive farmers in different districts, even departments, after having made, myself, conscientious experiments and having bred and studied larvæ. It is my opinion that by taking as a basis what takes place in other insects, taking for example the hornet (*vespa cabro*), the first invasion of the Dacus may be composed of flies of both sexes, and specially by females impregnated at the end of the season, which have sheltered themselves during the winter under the bark or in cracks of trees; this fact makes me sincerely regret that the farmers have abandoned the wholesome habit that the Greeks had of scraping with care the bark of their olive trees before the winter had set in. Operating in this way they destroyed any possible refuge for the enemies of their trees.

My opinion is confirmed by the fact that Mr. R. of Grasse, having cut down an olive tree in the middle of the winter, found in its trunk, perforated in many places by time and rain, Dacus developed into perfect insects and in large quantity.

I can not admit that there be only one generation, when all leads to show that there are at least three. I refuse to admit that the egg of the fly is deposited under the bark of trees, and that the larva, soft and apodal as it is, can possibly crawl as far as the fruit and work its way into it; this hypothesis is all the more inadmissible, as everybody knows that the olive hangs at the end of a long peduncle. I think that the Dacus becomes really dangerous only at the beginning of August; it is therefore then that it ought to be hunted and attacked in an intelligent and general manner. The more people will take advantage of the numerous counsels given, the greater will the following crop be the ensuing year. It is evident that Bernard of Marseilles was right when he said that all may be expected from time and study, but this is not sufficient; nature must be helped repeatedly.

The olive tree starts budding in May; from the 20th to the 30th of June the bloom appears. If it takes 2 months for the fruit to form itself and its oil, and to be of sufficient size to allow the larva to develop itself, it would only be in July that the female Dacus would prick the new fruit with its borer and deposit its eggs in the wound.

But what is to be done to fight against the Dacus during the months of August, September, October, and even November? Try and destroy the insect while on the tree is only a secondary means; to gather the olives at an early period would not be a much better mode, for you would only obtain little oil and its quality would be inferior. But a useful thing to do anyhow, would be to use Bernard's liquids, or any others as long as they are sugary, sticky, and aromatic; strings dipped in honey and stretched between the branches are good things, but great care must be taken to gather all the fallen olives, as these may contain larvæ, and their leaving the fruit and grinding themselves for their transformation must be prevented.

In years of great invasion of Dacus, as soon as it is seen that the olives change their tint, that the oily matter has sufficiently swollen the fruit, then all the berries must be gathered without exception, especially if the winter is slow in making its appearance; for it has been noticed that very warm autumns are detrimental to the crops; therefore, if at the end of November the cold does not appear, then gather in all haste and take your stock to the mill.

On the other hand if there are early signs of cold weather, then wait. The cold, even a slight frost, does not destroy the larva, not even the chrysalis, for experiments have proven that they can bear a lower temperature than that which we generally get in this climate, but it stays the development of the plague and consequently diminishes the intensity of the damage.

When the warm weather sets in, if you have not gathered in November do so in March. It is of the greatest importance that not a single olive should remain on the tree by the end of March, nor one on the ground, for the latter would be sufficient to guaranty the destruction of the crop for the ensuing season.

People generally have the bad habit of storing the olives in rooms or attics, in order, it is said, to improve both the quality and quantity of the oil; it is my opinion that this is done simply for economy's sake; either to have all the olives pressed together in one lot, or to have to pay a less amount of manual labor in carrying the crop to the mill. Up to a certain point I admit the system, for it is not every farmer who possesses a mill, and by going to a miller one has to wait one's turn; but in any case keep your stock for as short a time as you can, and watch it with great care; turn over the fruit very frequently, keep the heaps low so as to prevent fermentation and mouldiness, in order also to assist the larvæ to quit the olives; sweep constantly, twice a day is not too frequently, the storeroom, and on no account throw the

sweepings, in which there are larvæ and chrysalides, to the fowls, as it is generally done, for they let a certain quantity get away, neither throw them in the manure heap for the mild heat of the latter will facilitate their development.

Burn all your sweepings or throw them in a pond, for it is proven that the immersion of a few hours will destroy both larvae and chrysalises; also burn some juniper branches in the storeroom where the olives are kept. You can also, if you like, follow B. de Fonscolombe's advice, though it is 40 years old. Keep closed your storerooms, and place in them insect-eating birds, having the precaution to give them water to drink.

A fact which can not be contradicted is that the larva of the Keïron leaves the fruit as soon as it ceases being fed by the tree; the want of moisture or drying of the fruit are also reasons why the larva forsakes, the plucked fruit.

The whole mystery is solved in these three things: Early gathering, cares to be bestowed on the fallen fruit, as well as on that gathered.

Count Blancardi, of Sospel, who is always trying to find improvements, said to his farmer neighbors:

You perceive that your crop is attacked by the Keïron; your olives fall to the ground, and as you know them to be tampered you leave them there. Do you not fear that in so doing you encourage the plague? On the contrary, gather all the fallen fruit in order to force the larvæ to leave it, and then have it pressed; you will get a secondary produce, it is true, but you will have saved your next crop, and your work will not have been useless.

This advice is good to this extent, that it is always dangerous to leave olives attacked by the larvæ of the Keïron upon the ground, because, coming out of the fruit, they find shelter in the inequalities of the soil to accomplish their transformation; but to crush olives containing the remains and excrements of the Keïron is to obtain an oil neither clear nor having good odor, and which ought not to be mixed with oil obtained under good conditions. This is also the opinion of Dr. Maurice Girard, who says:

The oil made with olives containing the excrements of any larva is detestable.

Rosier, in 1804, and Roubaudi, in 1843, agree in saying that all oil made with fallen and sick fruit has a disagreeable taste.

I have said that the fly, during the winter months, shelters itself in the cracks of trees. I have had proofs of this from the Grasse districts; but on the Riviera, where the winter is so short, if the Dacus rests during the cold season it rouses itself pretty early in the year.

During this period of rest on what does it feed? An interesting question which has not as yet been cleared up. It has been seen to suck sweetened water prepared for it, but what its constant diet may be is not known.

Mr. Peragallo gives the place of honor in this class to the insectivorous birds of all kinds, recommending that they be invited to stay by all possible means. Spiders, too, he has found helpful about the trees, and the genus of Coccinella, to which our lady-bird, with its bright spotted wing covers, belongs. This latter family and their larvæ devour large quantities of the insectivorous enemies of the olive. Of Hymenoptera he describes four which are parasites of the Dacus, and two of the Cionus fraxini; also a Dipteran, *Phorocera picipes* (Rondani), parasite of a Lepidopter, the *Margarodes unionalis.*

(1) *The Eupelmus urozonus*, (Dalman).—One of Hymenoptera, said to follow the Dacus to the olive, lays its eggs in the fruit so that its larvæ may feed upon the larvæ of the Dacus. It is described as from 2 to 4 millimeters in length, green, head triangular, abdomen depressed.

(2) *Eulophus pectinicornis* (Latreille).—Another of the Hymenoptera which, more surely than the first described, preys upon the Dacus, as Mr. Peragallo observed them in his glass cases. The female is a bronzed green; the legs are white, excepting the feet and middle of the hips, which are the same color as the body. The male smaller, plumper, has some white on its abdomen and less green on its legs. It differs principally, however, in that its antennæ have long fan-shaped appendices which themselves are articulated. This insect always selected an olive attacked by the Dacus and laid its eggs in the hole made by that insect; the larva when hatched fastens itself to the larva of the Dacus and soon kills it; in this condition it was pointed at both extremities and of a transparent white color, showing a black cove, its chrysalis slightly flat, shining black in color. The chrysalis of another parasite of the same order, an Eurytoma, was of a lusterless black. The perfect insect was dead black shagreened. It differs further from the former by its slow movements, in which it seems hindered by its long and heavy antennæ.

The last parasite of the Dacus described was the *Ephialtes divinator* (Grav.) one of the Ichneumonides.

While studying the Cionus fraxini Mr. Peragallo found a number of Hymenoptera of the family of Chalcidites and genus Pteromaliens. These were of two distinct species, of which he was unable to find farther distinguishing names.

The first male, blackish metallic green, lighter, however than the female; abdomen rounded and as long as the wings; coupling with

the female it flaps its wings and seems to be in a frenzy. The female, a dark metallic green, knees and legs white, feet black, abdomen terminating in a pointed heart-shape beyond the end of the wings.

The second male short, head large, thorax a light green, wings longer than the abdomen, which is whitish, pointed, heart-shaped, with greenish extremity; legs rose color. It couples frequently and dies sooner than its female.

Female, short, heavily formed, wings longer than abdomen, which is chestnut color, with metallic luster; head aced, thorax dark metallic chestnut, legs rust-color, head as large as abdomen, antennæ yellowish at base, elsewhere brown, enlarged toward the end.

In studying the habits of the *Lepidopterous Margarodes unionalis*, Mr. Peragallo found that it had a parasite among the *Diptera genus Phorocera:* The Picipes of Rondani described as follows:

Length, 4 to 5 millimetres; forehead as wide as the eyes; 3 or 4 hairs fall on the cheeks below the point where the antennæ are inserted; others smaller grow outside of these; ear bristles; very slender antennæ; third articulation four times as long as the second; palpi black; shield black with grey luster; abdomen grayish black; edges of posterior segment hairy; legs brownish, lighter on thighs and tibias.

Female, like the male, third articulation not so long, forehead a little wider than the eyes.

RECAPITULATION.

First. Prune at the end of the winter or beginning of spring at latest; cut off all unhealthy branches and the smallest boughs of the summit of the tree, which are preferred by the insects. Take off at once from the large cut branches the branchlets and burn them the same night; in doing so large quantities of Phlœothrips, caterpillars, false-pucerons and butterflies will be destroyed. Make small piles with the largest branches, leave them as a trap for about 20 days, and then store them after having stripped from them the bark, which is to be singed or soaked in water for a week; large quantities of Phlœotribus or Keïron and Hylesinus, which would have eaten up the young stalks and produced new generations of insects, will be thus destroyed.

Second. Moths, Pyralis, and Moth-worms can also be destroyed by stretching through the trees strings covered with honey, upon which these butterflies during the night will be caught and the Keïron during the day.

Third. Watch over the shoots from March until the winter; shake them lightly from time to time in the early morning over an umbrella turned upside down, into which larvæ of coleoptera and caterpillars will fall; but do not destroy the spiders and the coccinellæ.

Fourth. Use against the Dacus or Keïron Mr. Bertrand's method, which is to hang between the branches when the fly appears, and as

early as the middle of September, flat dishes containing some sweetened and sticky liquid.

Fifth. As far as concern the cochineals, the false-pucerons and the Morphée, cut down the trees or prune them thoroughly, where they are located in very damp places, and as soon as the cochineal appears hunt it out. Kill it and treat the tree as described above.

Sixth. To fight the Phlœothrips keep the trunk and branches as smooth as possible in order to destroy the nests, and leave no perforated wood up the tree, particularly in the higher parts.

Seventh. Give air to the groves, plant the trees wide apart, drain the soil, let weeds be burned slowly in order to dry the atmosphere, and make smoke. Do this generally at night.

Eighth. Do not let the fallen olives lie; pick them up at once and burn or crush them.

Ninth. At harvest time pick up and burn the caterpillars and larvæ of the Dacus and the butterflies fallen upon the sheets.

Tenth. Leave the olive but a short time in the storerooms.

Eleventh. In these storerooms keep the windows closed; turn over the olives twice a day, and sweep up the larvæ and pupæ of the Dacus.

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WILLIAM HARRISON BRADLEY,
Consul.

U. S. CONSULATE,
Nice, December 6, 1890.

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SPECIAL CONSULAR REPORTS.

BEET-SUGAR INDUSTRY

AND

FLAX CULTIVATION

IN

FOREIGN COUNTRIES.

REPORTS FROM THE CONSULS OF THE UNITED STATES.

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BEET-SUGAR INDUSTRY AND FLAX CULTIVATION

IN

FOREIGN COUNTRIES.

Part I.—THE BEET-SUGAR INDUSTRY.

DISCOVERY OF SUGAR IN BEET, 1747.

REPORT BY CONSUL BULLOCK, OF COLOGNE.

The Beet-root Sugar Industry Association of Germany held its first annual meeting, for 1881, at Cologne, May 23–26. The proceedings consisted of addresses and reports respecting the development and state of the beet-root sugar industry. As much interest has recently been shown on this subject in the United States, it may be opportune to present a brief sketch of its growth and present condition in Germany.

For the discovery of sugar in the beet and the process of its extraction, according to Dr. Scheibler, in a memorial address to the Beet-root Sugar Industry Association, we are indebted to two German scientists, Dr. Andreas Sigismund Marggraf, professor of chemistry and member of the Berlin Academy of Science, who was born at Berlin, March 3, 1709, and to his pupil and successor, Franz Carl Achard, born at Berlin, April 28, 1753.

In the year 1747 there appeared in the reports of the Berlin Academy a communication by Professor Marggraf, wherein was fully detailed the process by which he had been enabled to "find beet-root sugar in abundance, exactly like that extracted from the sugar cane." In this communication Professor Marggraf spoke of the feasibility of profitably manufacturing sugar out of the beet root, and in this respect said:

> From the experiments here set forth it is evident that this sweet salt (the chemists of that time designated every soluble matter "salt") can be prepared in our region just as well as where the sugar cane grows.

It does not appear, however, that Marggraf followed up his discovery by practically demonstrating its capability of being profitably developed. This was left for his pupil, Achard, who, on the 11th day of January, 1799, addressed in a petition to King Frederick William III, a

"Treatise upon the preparation of sugar from the beet root, much cultivated as cattle food in many of the provinces of your Majesty's domains," and prayed, in order that the petitioner might "be enabled to enjoy the fruits of his labor, prosecuted for fifteen years with great diligence and cost," the concession of "the exclusive privilege for ten years for the manufacture of native sugar and the grant of sufficient land, whose soil would be adaptable to beet-root culture," where said beet-root culture would be carried on after his method, so that he could be placed in a position to prosecute his enterprise, for which he had been assured of the assistance of capitalists.

After searching examinations and manifold negotiations, the King granted a loan of 50,000 thalers ($35,700), with which Achard bought suitable land in Lower Silesia, where, in 1801, he built a factory, which was set in operation in March, 1802. Achard's enterprise found many imitators in that same year. General Blanknagel erected a sugar factory in the government of Toula (Russia), and in this and the following year two sugar factories were erected near Paris and several in Prussia, the most important of which were those of Baron von Koppy, near Strehlen, in Lower Silesia, and of Von Nathusius, in Althaldensleben. But shortly after this the wars of Napoleon swept over Prussia, and for many years the development of the sugar industry made but little progress.

In the winter of 1809–'10 the factory of Achard fell a prey to the flames, and its founder was left heavily involved in debt. Nothing daunted by these misfortunes, Achard courageously set about to devise ways and means to extricate himself from debt and start his enterprise anew. He succeeded in obtaining a release from the King of the debt of 50,000 thalers, and a new advance of 20,000 thalers, wherewith he paid his most pressing debts, and erected upon the ruins of his factory a school for practical instruction in the beet-root sugar industry. His efforts, however, did not meet with the success he had hoped. The industry made no progress, and Achard, at the time of his death, April 20, 1821, had not experienced the satisfaction of seeing the prosperity of that industry to which he had devoted the best years of his life, and for which he had sacrificed fortune and an honorable position. It is true that about this time the continental blockade had driven the price of sugar up to 6 to 7 francs per pound, avoirdupois, and after Napoleon offered a million of francs premium for beet-root sugar many sugar factories had been erected in France; but as they had been created by the Empire they disappeared shortly after the French restoration. One, only, among all the sugar manufacturers of France, was able to bear up against the flood of disaster which swept over them, and this exception was notable, inasmuch as it marked the turning point from whence the native sugar manufacture rose through many difficulties to be self-sustaining.

Crespel Delisse established a factory at Lille on the plans indicated

by Achard, and subsequently another at Arras. By remarkable energy and capability he raised the industry from prostration to prosperity, and in 1828 he was owner of three factories and part owner of three others. The number of beet-sugar factories in France at that time reached 103. During the following 20 years Crespel Delisse remained the great authority in all matters pertaining to the industry, and was ever the honest adviser and instructor of those who sought information from the store of his experience.

From that time forth the industry grew apace. In France, in 1837, beet-root sugar was first subjected to taxation, and there were 585 factories in that country, which produced 1,000,000 centners of sugar.* Germany had at that time 156 factories, which produced out of 2,764,000 centners of beets 153,300 centners of sugar, or 1 centner of sugar to 18 centners of beets. In 1841 the system of taxing the beet-root was introduced into Germany by imposing a tax of 3 pfennigs per centner. This tax has been gradually increased until it now amounts to 80 pfennigs† per centner. This method of levying a tax upon the beet-root instead of upon the sugar produced has worked satisfactorily, and is cited approvingly in contrast to the changeable systems of other countries.

The following table shows the growth of the sugar industry in Germany for the last five decades:

Season.	No. of factories.	Beet root worked.	Raw sugar produced.	Tax on beets per centner.	Taxes received, less amount repaid for drawback.
		Centners.	*Centners.*		
1840-'41	145	4,829,734	248,102	3	15,841,119
1850-'51	184	14,724,309	1,066,979	30	15,628,293
1860-'61	247	29,354,032	2,530,520	75	25,799,490
1870-'71	304	01,012,912	5,259,734	80	39,501,081
1880-'81	331	126,415,938	10,600,000	80	50,000,000

The foregoing table shows that since 1850 the sugar industry of Germany has doubled with every decade. A wonderful progress, truly, whose effect upon the economical condition of the country can hardly be estimated. A drawback of taxes is allowed upon sugar exported, and is calculated upon the basis that 11.75 centners of beets yield 1 centner of sugar. This estimate has been proved to be practically correct, the average for the last nine years being 11.60 centners of beets to 1 centner of sugar. The consumption of sugar in Germany falls greatly below that in the United States or England, having averaged for the last three years 14.50 pounds, avoirdupois, per head, or about one-third of the annual average consumption per head in the United States. This

* One centner is equal to 110.5 pounds advoirdupois.

† 80 pfennigs are equal to 19 cents.

comparatively small consumption is a cause of complaint by the sugar manufacturers and is generally attributed to the rate of taxation imposed on the industry. If we take 30 marks as the average price of 96 per cent. raw sugar, including taxes (and the price has not recently varied from this), the tax of 80 pfennigs on the beet-root increases the price of sugar nearly 50 per cent. A reduction of 45½ per cent. upon the rate of taxation upon sugar was made by the French Government, October 1, 1880, and in the following 6 months the consumption of sugar had increased at the rate of 35 per cent. per annum, while the French minister of finance had estimated an increase of 20 per cent.

This rate of increase will show for France, in 1881, a consumption of 27¾ pound avoirdupois per head. It is therefore much discussed whether it would not be advantageous for Germany to follow the example set by France. This course would no doubt widen the field of agricultural activity. The industry is becoming more purely agricultural from year to year; that is, it is no longer the large landed proprietors and capitalists who alone erect and operate sugar factories, but the small landowners, and even the peasants, unite and build factories for the manufacture of sugar from the beets raised in the neighborhood.

Beet-root culture, as practiced in Germany, does not in the least affect the yield of other products, for the thorough cultivation which it requires increases the fertility of the soil and does not exhaust its mineral constituents; the sugar is drawn from the atmosphere, and the richer the beet is in sugar the less mineral substance it contains. It gives remunerative employment to the laborer in winter, and in summer is an inexhaustible source of great and increasing wealth to the nation.

GEO. E. BULLOCK,
Consul.

UNITED STATES CONSULATE,
Cologne, June 1, 1881.

GROWTH OF THE BEET-SUGAR INDUSTRY IN EUROPE (1879).

REPORT OF CONSUL POTTER, OF STUTTGART.

As experiments in the manufacture of beet-root sugar are being made upon a somewhat extended scale in some parts of the United States, I have presumed that a few statistics concerning its production in Europe, coupled with facts and opinions gathered from statements of the most intelligent and successful German manufacturers, might be of possible interest at this time.

Highly intelligent experts in the beet-root sugar industry of Germany, who have carefully studied the climate and soil of America, do not hesitate to express the opinion that in a few decades the United States will supply their own enormous sugar demand chiefly from the beet, as has been the case in Germany for many years past. The progress of this

industry in the United States is being watched with the greatest interest by manufacturers in Germany, who, judging by the light and hasty manner in which this difficult subject is treated in some of the plans for new beet-sugar manufactories in the United States, predict that severe disappointment will be the result.

The following facts are therefore cited, not only as a timely warning, but also for the purpose of encouraging those who propose, in a judicious way, to embark in a noble enterprise that may lead to results of the highest importance to the agricultural interests of the country.

In the first place, which parts of the American Union appear to be most favorable to the production of the sugar-beet?

The map of Europe and the long experience of manufacturers and producers there furnish a ready answer: The northern part of France, Belgium, a part of Holland, the Lower Rhine district, Hanover, Brunswick, the neighborhood of Magdeburg and Halle, Silesia, Bohemia, and a portion of fertile Poland furnish by far the greatest part of the sugar product of Europe. In all of these countries, which are those best adapted to the culture of the beet, the richest lands are devoted to this purpose. Their climate is generally humid and too cold for grapes and Indian corn, not because the summer is too short for the latter, but because the average temperature from the end of March to the end of October is too low and the humidity of the atmosphere at the same time too great. The countries named have during the year from 20 to 30, seldom more than 40, so-called summer days; that is, days when the thermometer rises to 77° Fahr.

The abundant dews, which are produced by cool nights, are a life element with a northern plant like the beet. South of 50° latitude in France and Germany there are but few sugar manufactories, and these are, by reason of the climate, more unfavorably located than those in the north. In Southern France proper, in Switzerland, Italy, and other countries of Southern Europe, there are no sugar manufactories, with the exception, perhaps, of a few that may have been established as an experiment, but which do not promise successful results. The reason of this probably is that in the northerly countries the growth of the beet goes on uninterruptedly during the summer in consequence of the greater moisture of the climate, while in autumn the cool nights check the further growth and develop the sugar in the roots.

In the warm countries of Central Europe, however, where Indian corn flourishes, the dry warmth of summer frequently impedes the growth of the sugar-beet, while the warm autumn encourages the growth *only* of the plant, instead of the formation of sugar. The development of sugar in the maple tree is similar to that in the beet, in this respect, that both require for this process warm sunny days and cold nights.

If, besides the northerly countries already named, there were no other parts of Europe adapted to the growth of the beet, viz, those parts having a hot summer, like that which generally prevails in the United

States, the prospects of the latter as a sugar-beet producing country would be very unfavorable. Fortunately, however, the experience in eastern part of Europe, particularly the extended neighborhood of Kiew, in Russia, which is the chief center of the Russian beet-sugar industry, shows that the beet may be cultivated with great success in countries where the summer is hot, provided the climate is not too dry.

From the foregoing facts it is evident that the establishment of beet-sugar manufactories in the United States should not be undertaken until the subject in all its bearings has been carefully and thoroughly investigated, for it is, of course, an essential point in the successful management of every manufactory to have, not only in most years, but *every year*, a plentiful and certain supply of raw material of best quality at command.

Besides the climate, therefore, the matter of fertilization becomes a most important consideration. The beet plant draws its sugar mainly from the fertilizers used, and not from the body of the native soil. For this reason there need be no fear of exhausting the soil so long as it is highly manured. There is not in the vegetable kingdom, probably, another plant that will so quickly impoverish the soil when fertilization is insufficient or wholly wanting. It is, therefore, evident that success in the cultivation of the sugar-beet is dépendent upon bountiful and unstinted fertilization. Even with this provision, every other year there should be planted different intervening crops upon the same soil. There are sugar plantations in Europe whose originally excellent soil has become totally exhausted, simply because of insufficient fertilization, and, as a result, the manufactories connected with them have failed.

A brief reference to the manufacture of sugar, from its beginning in Germany, may be of service to those proposing to engage in a similar enterprise in America.

As is well known, the sugar of the beet was discovered by a German chemist named Sigismund Marggraf. On the 3d of March, 1747, at a session of the Academy of Sciences, in Berlin, he stated that he had found, in several of the indigenous plants, the same kind of sugar as that in the cane, and that the Silesian beet contained the greatest proportion of saccharine matter. He also proved that the extraction of sugar from this plant by his method was not only possible but might also be made profitable.

Political disturbances prevented Marggraf from enjoying the honor of establishing the first beet-root sugar manufactory, but his pupil, Achard, founded the first establishment of this kind in Cunern, in Silesia, in the year 1790, and obtained 6 per cent. raw sugar and 3 per cent. molasses from the weight of the freshly harvested beets. Achard wrote to a friend in France concerning his success, and the subject was agitated there. His letter, in which he dwelt upon the advantages of the beet-sugar manufacture and its great benefits to agriculture, was published in all the newspapers of France, and created

throughout the country quite a sensation. As a consequence, in the year 1800, two establishments for the manufacture of beet sugar were founded, by way of experiment, in St. Owen and Chelles, near Paris. The results, however, were so unfavorable and discouraging in comparison with those of the Silesian manufactory that this branch of industry was abandoned, and rarely referred to in France for many years afterward, except in terms of ridicule.

Some time later, Napoleon I, in order to facilitate the accomplishment of the continental blockade, which was planned as a blow at England, encouraged the manufacture of beet sugar by enormous appropriations of money. But with his fall most of the manufactories failed, with heavy losses.

About the year 1812–'15, animal charcoal began to be employed for the purpose of bleaching and purifying the sugar, thus opening a new era for this industry. This most important invention, in connection with further progress in chemistry and mechanics, was the means of calling into existence no less than 103 manufactories in France in the brief period of the 13 years previous to 1828. The total product of these 103 establishments was only 6,630,000 pounds of raw sugar, being an average for each manufactory of about 66,000 pounds, or the product of about 40 English acres of beets.

The German manufactories began even more cautiously, for in the year 1836, 122 establishments produced only 3,111,901 pounds of raw sugar, made from 56,761,530 pounds, or 28,007 tons of beets, making an average for each manufactory of only 25,525 pounds of raw sugar and 459,250 pounds of beets, which would be about the yield of 20 English acres fairly cultivated, and producing an average of about 11 tons to the acre.

This commendable prudence and caution in the establishment and manipulation of manufactories in France and Germany was a consesequence of former enormous losses, resulting from the attempts of enterprising men to engage extensively in a business which they did not understand, and before they had studied it with sufficient care to master the difficulties that stood in the way of success. Their experience should be a serious warning to producers in America, and admonish them to begin with small, very small establishments, and study every step taken until they have learned the business in its minutest details, and are sure of a profit on their labor and investments. Expansion and large investments in this industry will then be safe, for the demands of the market for their production will be substantially without limit. The planting of 100 acres would be a liberal beginning for the first year. With even this small beginning the planter might pay dearly for his agricultural experience before he had carried a single load of his produce to the "new factory."

The experience of properly keeping the beets after harvesting is often as dear as that gained by labor in their culture. As soon as the

beets are taken from the ground, very shallow trenches are dug, and the beets are piled therein in such manner as to have at least three-quarters of the heap above the surface of the earth before covering.

The danger of heating in the heaps covered with earth is fully as great as that of freezing. This heating is caused by making the heaps too high, and the injury resulting therefrom, as in the case of fresh grain, can never be made good. For this reason, the cellar is a most objectionable place in which to store the beets. The first essential to safety is the ripeness of the beets, and a moderate temperature at the time of harvesting. The golden rule "out of the earth into the earth" is always to be kept in mind, for in the air, particularly when the sun shines, the roots soon wither and become soft and elastic, in some degree like rubber.

This is the first step towards decomposition after they have been taken out of the ground, and is more to be feared than frost. If possible, the beets should be buried or covered the same day that they are harvested, and should be placed in heaps not more than 2½ feet high by 3 feet broad, and should be covered just deep enough to prevent freezing. Straw is always dangerous on account of heating, decay, and mice.

That the caution of the German manufacturers was well advised is proved by the fact that the number of factories, which had risen in the year 1838 to 159, had decreased in the year 1845 to 96. From this depressed condition, with the assistance of past experience and new inventions, the industry progressed in a healthy manner, and the following statistics show how steadily the average production of the different manufactories has increased up to the present time:

Year.	No. of manufactories in operation.	Total amount of raw sugar produced.	Average product of raw sugar in each manufactory.	Beets required for 100 pounds of raw sugar.	Remarks.
		Pounds.	*Pounds.*	*Pounds.*	
1836	122	3,111,901	25,525	1,989.00	About 20 pounds beets to 1 pound sugar.
1845	96	33,489,014	348,848	1,624.35	About 16 pounds beets to 1 pound sugar.
1850	184	117,901,179	640,789	1,514.90	About 15 pounds beets to 1 pound sugar.
1855	216	193,063,832	893,834	1,381.25	About 14 pounds beets to 1 pound sugar.
1860	247	279,622,460	1,132,072	1,281.80	About 12½ pounds beets to 1 pound sugar.
1865	295	410,387,276	1,391,089	1,292.85	
1870	304	581,200,607	1,911,871	1,281.80	
1875	310	765,092,497	2,468,017	....	
1877	326	848,259,659	2,568,017	....	
1878-'79	329	850,850,000	2,585,700	....	

NOTE.—In the years 1860 and 1870 the quality of the beats raised was unusually good.

The weights above given are stated in English pounds.

The progress made in the process of extracting sugar from beets is shown by the gradually decreasing amount of beets required to produce a certain weight of sugar. In the year 1836 about 20 pounds of beets, and in 1860 only about 12 pounds were needed to make 1 pound of raw sugar.

The production of beet-sugar in all Europe during the 4 years ending June 30, 1879, was as follows:

Year.	Weight.	
	Centners.	English pounds.
1875–'76	27,452,255	3,033,474,177
1876–'77	22,022,823	2,433,521,941
1877–'78	28,416,544	3,140,028,112
1878–'79	28,200,000	3,116,100,000

The total production for the year 1878–'79 was divided among the several European countries as follows;

Countries.	Weight.	
	Centners.	English pounds,
Germany	7,700,000	850,850,000
France	7,600,000	839,800,000
Austria-Hungary	6,700,000	740,350,000
Russia and Poland	4,300,000	475,150,000
Belgium	1,300,000	143,650,000
Holland and other countries	600,000	66,300,000
Total	28,200,000	3,116,100,000

Showing a consumption of about 10 pounds per year, or less than half an ounce per day to each inhabitant of Europe.

Upon this historical basis perhaps a better view may be taken of the general considerations connected with the establishment of beet sugar manufactories in the United States. Taking as a basis of judgment the facts developed by the beet-sugar production of Europe, the climate of the New England States, the vicinity of the Great Lakes, and in the same direction or zone westward, would appear to be the localities most favorable for the production and culture of the sugar-beet. But, in view of the important fact that the so-called Indian summer of the Middle States is very favorable to the best development of sugar in the beet, the boundary of successful cultivation may be possibly extended to the Ohio River. It may, however, be considered hazardous to undertake this industry south of this line, unless tests and experience shall prove the contrary.

Besides the Indian summer, the United States has another important advantage in the fact that the spring season, although somewhat late, continues warm from its beginning, and is therefore for the young beet more favorable than the cool, moist weather which sometimes occurs in Germany in the months of April and May.

In considering the cost of cultivating and harvesting the sugar-beet the farmer of the United States may safely consider himself as possessing a high per cent of advantage over the European farmer in the vastly superior machinery for harvesting and cultivating which is always at his command. He will also be free from the enormous ad valorem tax*

* The imperial tax collected by the German Government upon sugar-beets raised within its jurisdiction amounts to more than 80,000,000 marks per annum.

which the German farmer is obliged to pay upon his beets before they are crushed at the sugar factory. In the process of manufacture in late years many improvements have been introduced. The present diffusion method (extracting the sugar with water) does not require more than half as many workmen as by the former method of hydrostatic pressure.

It may also be considered a fortunate circumstance for the United States of America that the manufacture of beet-sugar has not heretofore been attempted on an extensive scale. The European farmers and manufacturers have suffered all the discouragements and losses incident to 20 years of experiments in developing this industry before it began "to pay." This development has been slow because the disasters resulting from such experiments had made those engaged in the enterprise very cautious until perfection in methods of manufacture had been nearly attained. The advantages of all this expensive and tedious experience is now available to the people of the United States, and there seems to be no reason why the inauguration of this great industry into many of the different States of the Union should not be met on all sides with substantial and hearty encouragement. With a more favorable climate and a boundless area of better soil, with superior machinery and cheaper fuel, with labor in abundance and an unlimited market there appears to be no obstacle in the way to prevent the manufacture of beet-root sugar from being prosecuted with a degree of success in the United States far in advance of that attained by European producers and manufacturers.

The enormous advantages of sugar-beet planting to the agriculture of a country having a domain so extensive as that of the United States can not be estimated too highly. These will become evident when a farmer, having the advantage of a favorable climate and suitable soil, begins operations with a small plantation and gradually increases his business, according to his success, until he arrives at independence, which he surely will do, with prudent and skillful management and proper surroundings.

No industry could probably be introduced into the United States that would more rapidly add to the wealth of the country and the contentment of its people, for its prosecution requires a large number of workmen, and its product comes wholly from the soil. For these reasons, and with a favorable commencement, it is not extravagant to predict that its growth would be so rapid that in a few decades the sugar production of the United States, as an article for home consumption and export, would rank second only in importance to the great staple productions for bread.

In conclusion, it is proper to refer to the subject of suitable sugar-beet seed for America. Germany and France produce two varieties of sugar-beets. The first produces a comparatively small weight to the acre. But these are not only much richer in sugar than the other kind, but grow entirely underneath the soil, a fact of much importance to the

farmers of America where there are often severe frosts in the month of October. In France the frost rarely appears in November, and consequently the French beets, which frequently grow half above ground, are not greatly endangered. The German sugar-beet seed is, therefore, greatly to be preferred for the climate of the United States. It is predicted that the difference in the product of these two varieties of seeds will be so great in the United States as to produce in the manufacture of sugar success with one variety and, by reason of frost, etc., perhaps, entire failure with the other.

The seed of the Silesian beet and the seed grown in the vicinity of Magdeburg are most to be recommended.

J. S. POTTER.

UNITED STATES CONSULATE,
Stuttgart, November 1, 1879.

BEET-ROOT SUGAR MACHINERY AND MANUFACTORIES (1880).

REPORT BY CONSUL POTTER, OF STUTTGART.

With a view of furnishing to those interested information as full as possible concerning the manufacture of beet-root sugar in Germany, I herewith forward carefully prepared estimates for the construction of machinery for a mill, complete in all particulars, for the manufacture of sugar from beet roots.

These estimates are furnished by an establishment well know in Europe as being among the most responsible and advanced in the manufacture of the best quality of improved machinery for the purpose named, and they provide for a mill capable of working up 100 tons of beets daily and also for a mill with a working capacity of 500 tons daily.

The manufacture of beet sugar by hydrostatic pressure is now obsolete in Germany, the diffusion process being adopted instead, because the percentage of sugar obtained from the beets has been largely increased by the latter method. By the old process 20 to 30 pounds of beets were required to produce 1 pound of sugar. By the new method 10 to 12 pounds only of beets, of good average quality, produce 1 pound of sugar, besides a considerable percentage of molasses. The estimates herewith submitted are for the most improved machinery for the modern diffusion process.

A plan of a building for a medium-sized mill is also herewith submitted. It should be remembered that the measurements and figures thereon represent *millimetres*.

I have attached to the estimates furnished copies of the letters received from the Braunschweig Company, in order that those interested in the subject may be made familiar with the responsible character of the statements therein contained.

A table showing all the elements of cost that enter into the production of sugar by the improved German methods is also given. This table is made up from the carefully tested average results of three years' operations of a well-organized and successful manufactory in the northern part of Germany, and may be confidently relied on as accurate. The German Government collects a revenue tax on the value of the beet roots after they are washed and ready for cutting. The official collecting this tax has a room in every manufactory and superintends the weighing of the beets. As the American manufacturer will not have to bear a similar burden this important item of cost has been omitted in the table referred to.

For the benefit of the farmer proposing to engage in the culture of the sugar beet, I will suggest that deep, rich, moist, bottom land is dangerous ground upon which to experiment with a view of obtaining successful results. From such land he may obtain enormous crops in bulk and weight (20 to 25 or more tons per acre), but his product will be merely water with very little sugar, and the more tons he raises the more complete will be his failure. He will furnish the manufactory with a large amount of bulky material while the product in sugar will be very discouraging. It is well known that many of the French farmers, who cultivate a kind of beets which grow very large and partly above ground, often produce 30 tons to the acre, and yet utterly fail in the business, while the prudent and thinking German succeeds admirably with smaller beets, producing 11 or 12 tons to the acre. In one case a great weight of water is produced, containing a small amount of saccharine matter, while in the other a beet is produced rich in sugar properties, and yielding more pounds of sugar to the acre with less than half the labor and cost of production.

Rolling, and even hilly land, where there is not an excess of moisture, is best for the sugar beet. It should be strong and well enriched. One of the very best fertilizers is wood ashes, and material containing alkaline properties. The elements that produce sugar in the maple tree will develop sugar in the beet. In this connection it may be mentioned that ashes from the wood of the sugar maple tree are regarded as among the most valuable of all ashes in the production of potash.

These hints will be quite enough for the intelligent farmers of the United States, and if those who propose to engage in the culture of sugar beets will carefully study the subject they wish to master, and remember that they should seek to produce the largest quantity of sugar in the smallest amount of raw material, and that it is concentrated substance and not bulk or magnitude of material that is wanted, success in sugar-beet culture will be assured.

The reduction in the cost of a mill smaller than the one for which estimates in detail are herewith furnished would not, of course, be in proportion to its reduced capacity. I have equally complete estimates for a manufactory capable of working up 500 tons of beets daily.

The recapitulation only of the total cost of such an establishment is given.

In order to insure the success of the experiment in making sugar from beet-roots in the United States, it is safe to recommend the construction of an establishment large enough to control all the economical advantages which science and late discoveries present.

For further information I would refer to the following letter, received from the directors of the Braunschweigische Maschinenbau-Anstalt in Braunschweig:

BRAUNSCHWEIG, *March* 22, 1880.

SIR: From the inclosed note you will see that at the price for beet-roots of 1.034 marks per centner, 0.800 mark duty, the hundredweight of beet-roots will cost, to be worked up, 2.617 marks, including both sums. Consequently, without duty, which we understand is not paid in America, the cost is reduced to 1.817 marks.

The amount of coals used will depend upon the size and construction of the manufactory; 12 to 30 per cent. of coals to the weight of beet-roots is required. If we reckon the cost at 1 mark, you will see from the inclosed note that here in Germany about 15 per cent. coals are used.

With regard to wages, 0.158 mark is, as you will observe, paid per centner of beet-roots, the men earning, on an average, 1.75 to 2 marks, the women 1 to 1.20 marks per day. All other details you will find in the table following.

The calculation of cost for the production of 1 centner raw sugar in America, resulting herefrom, is very simple. The result will differ according as you take 10, 11, 12 or more centners beet-roots to the centner of sugar. With good beet-roots we require here, with the three grades of product, 10 centners of roots to 1 centner of sugar. One centner sugar will, therefore, cost 10 times 1.817 = 18.17 marks, without duty. Besides this, there will be a gain of about 3½ per cent. molasses on the weight of beet-roots, which represents a value of about 5 marks per centner, according to present prices.

There still remains the food product for cattle, etc., the value of which we presume the American farmer understands, and we have not, therefore, given it a price.

I am, sir, yours, most respectfully,

BRAUNSCHWEIGISCHE MASCHINENBAU-ANSTALT.
M. HECHT.

HON. J. S. POTTER, *United States Consul.*

The following table shows in detail the average cost of extracting, by improved German machinery, the raw sugar produced by 1 cwt. of beet-roots of good average quality:

Table showing average cost of working up 1 centner beet-roots, the product of which is about 10 per cent. raw sugar and 3½ per cent. molasses=11 pounds sugar and 3.65 pounds molasses.

Elements of cost.	German marks.	United States cents.
1 centner beet-roots, washed and ready for cutting	1.034	24.61
Coal	0.153	3.90
Coke	0.011	
Muriatic acid	0.004	
Bone charcoal	0.019	1.09
Materials	0.023	
Press-cloths	0.006	
Sacks	0.017	2.23
Limestone	0.006	
Repairs	0.065	
Wages	0.158	4.78
Salaries	0.043	
Interest	0.101	
Miscellaneous expenses	0.022	
Commissions	0.015	6.61
Insurance	0.017	
Wear and tear, depreciations, etc	0.123	
	1.817	43.22

It will be seen by the foregoing table that the cost of producing clear raw sugar from beet-roots in Germany is about 4 cents per pound. After the sugar there still remains a considerable percentage of molasses, the value of which should be credited to the cost of producing the sugar, thus reducing the actual cost of good raw sugar from beet-roots to about 3½ cents per pound.

The value of the residuum as food for cattle or manure will be estimated according to the demand for it existing in the neighborhood of the factory.

BRAUNSCHWEIG, *March* 12, 1880.

SIR: Respectfully referring to your note of the 4th instant, we have the honor to submit to you the inclosed two estimates for the complete fitting up of sugar manufactories for the working up of beet-roots, in the one case of 100,000, in the other of 500,000 kilograms daily.

These estimates can not be considered entirely reliable *under all circumstances*, as a knowledge of the building, locality, and water privileges is indispensably necessary for the drawing up of binding contracts. They may, however, be regarded as essentially correct, and only subject to unimportant changes.

We add drawings of the ground plan of a middle-sized manufactory, and are prepared to give further details.

According to your wish, we have the honor to forward you two copies of the ground plan of the sugar manufactory, Jülich, and at the same time beg to state that we will willingly send one or two skillful engine-fitters to America with the machines to assist in their erection, for whom, besides free passage there and back and entirely free accommodations, 10 marks per man per day, including time of journey, would be required.

Yours, most respectfully,

BRAUNSCHWEIGISCHE MASCHINENBAU-ANSTALT.
M. HECHT.

Hon. J. S. POTTER,
Consul of the United States of America in Stuttgart.

Estimates for sugar manufactory.

No.	Machinery, fixtures, etc.	Kilograms.	Price.	Total.
	A.—*Machinery and apparatus.*		*Marks.*	*Marks.*
1	2 beet-root washing-machines with perforated iron *5‡, strong metal drums, and with iron boxes, each of *3,250‡, length. The drums have a diameter of 1,100‡, are provided with crosses forged in a piece, and one of them has a stone sorter. The machines have each 2 deposit valves, 2 manhole plugs, gaseliers and communicating cylinders, including stationary and loose pulleys .... per piece..	....	3,000.00	6,000.00
2	2 beet-root wagons capable of containing 500 kilograms, per piece	....	350.00	700.00
3	1 cutting machine with a disk, armed with 8 boxes and communicator, with stationary and loose pullies and disengaging gear, and with filling funnel	....	....	2,100.00
4	16 blade-boxes for the same .... per piece..	....	30.00	480.00
5	10 sets of finger-blades for the same .... per set..	....	32.00	320.00
6	10 sets of lateral-cutting blades for the same .... do....	....	40.00	400.00
7	2 railroad cutting-wagons of sheet-iron, with filling funnels .... per piece..	....	230.00	460.00
8	70 running rails, including the necessary tenter-hooks, per running millimeter	....	1.20	91.00
9	14 diffusors of 1,100‡ and 1,570‡ height in the direct plates, complete each with 2 manholes, the upper one with horizontal covers capable of being turned, the lower one with strong covers hanging on hinge joints. These are arranged for caoutchouc packings, to be tightened by means of wrought-iron hoops and span-screws. On the jars are brackets for the reception of transferable pipe-supports and props for the junction of the conduit of pipes, per piece, 925 kilograms	12,950	53.00	6,863.00
10	14 metal stop-cocks for the same of 20‡ .... each..	....	9.00	126.00
11	14 perforated wrought-iron sieve bottoms to be inserted in the upper manholes of the diffusers, and 14 similar ones for the lower vaulted bottoms of the jars. The jars receive the whole diameter of the diffusors, and lie with the lower inner edge of the manhole in an horizontal position at 50 kilograms .... each..	700	0.75	525.00
12	14 calorisators, each of 1.5 square meter heating surface, with brass pipes and stuffing-box packing .... per piece..	....	250.00	3,500.00
13	14 steam-port valves of 33‡ .... do....	....	24.00	336.00
14	14 self-acting steam exhaust port valves of 26‡, with gauge cocks .... each..	....	26.00	364.00
15	14 thermometers .... do....	....	15.00	210.00
16	14 transferable pipe supports .... do....	....	9.00	126.00
17	14 wrought-iron loosening keys .... do....	....	6.00	84.00
18	14 guide eyes to the same .... do....	....	3.00	42.00
19	2 keys to the manholes of the diffusers .... do....	....	6.00	12.00
20	1 metal purging cock .... do....	....	....	20.00
21	57 valves of 78‡, with red brass spindles and stuffing boxes, with wrought-iron hoop, so constructed that the conical valves do not turn .... each..	....	50.00	2,850.00
22	7 wrought-iron winch cranks .... do....	....	3.00	21.00
23	A complete cast-iron set of pipes, with cut flanges and bored screw holes .... per kilogram..	2,000	33.00	660.00
24	28 4-edged caoutchouc packings for the manholes of the diffusers .... each..	....	6.00	160.00
25	To about 280 drillings, the requisite caoutchouc sheaves and screws .... each ..	....	2.00	560.00
26	Iron foundation below the diffusers consisting of cast-iron horses and square supports, including hooping..per kilog'm.	2,500	24.00	600.00
27	1 cutting worm between the diffusers, including wrought-iron trough and motor .... per kilogram..	2,750	63.00	1,732.50
28	Flooring plates with perforated metal between the diffusers .... per kilogram..	800	0.70	560.00
29	2 improved cutting presses .... each..	....	1,325.00	2,650.00
30	1 distributing worm screw to the above presses, including wrought-iron trough, etc., omitted	....	....	....
31	6 deposit boxes for cuttings on the cutting floor .... each..	....	60.00	360.00
32	The entire communication of motion for the whole of the working machines (driving engines), with all of the iron parts for the elevators and transports, for the moving of the beet roots and beet-root cuttings, as well as the coal, the brackets, the drop, etc., consisting in well-made rollers, pulleys, wheels, bottom plates, and brackets with metal pillars, etc .... per kilogram..	35,000	63.00	22,050.00
33	Tin pockets and chains for the protractors .... do....	200	1.30	260.00
34	90 wooden fillets .... each..	....	.50	45.00
35	320 fastening screws .... do....	....	.50	160.00
36	Wrought-iron chains with steel screw bolts in drawn wrought-iron pipes .... per kilogram..	800	1.10	880.00

* The measures are given always in millimetres and the weight in kilograms.

Estimates for sugar manufactory—Continued.

No.	Machinery, fixtures, etc.	Kilograms.	Price.	Total.
	A.—*Machinery and apparatus*—Continued.		*Marks.*	*Marks.*
37	1 grindstone for the blades, with iron trough, including stationary and loose pulleys			150.00
38	4 complete separating pillows of 1,500ʒ, and 1,700ʒ height in the direct plates, with armature to the same, consisting in: 1 passage valve, 1 steam valve, 1 carbonic-acid tube, 1 carbonic-acid worm, 1 steam valve, 1 juice outlet valve, 1 scum worm, 1 juice inlet valve, 1 knee and 1 cross support, 1 passage cock, 2 guide eyes, 2 loosing rods, 1 winch crank, and saturer, with cover and drying tube........per piece..		850.00	3,400.00
39	4 tubes for saturer as before ....do..		850.00	3,400.00
40	2 chalk measuring barrels, each with two cocks........each..		100.00	200.00
41	6 scum-filter presses, each with 18 chambers; each chamber with fluted lateral planes, unscrewed sieve plates, a metal drilling apparatus for the cloths, and an outlet cock, the valves with turned wrought-iron columns, wrought-iron cones ....each..		1,200.00	7,200.00
42	1 stone catcher, with sieve			100.00
43	6 sugar centrifugal machines, with welded drums and full bottom plates, with protecting hoop........each..		1,000.00	6,000.00
44	1 complete double mash machine			1,350.00
45	1 sugar carriage with juice catcher			120.00
46	2 iron washing basins, with pipe connected below them, and 2 outlet cocks			875.00
47	1 complete coal-washing machine, with wheel communicator entirely of iron			2,200.00
48	1 tilting apparatus for the same			150.00
49	All the iron parts to 3 Langen coal-heating furnaces, with firing in tiers, trisected heating cylinders, and with self-acting withdrawing apparatus, excepting dryer, each with 28 cylinders, with hard-soldered cooling pipes of sheet iron ....per piece..		1,950.00	5,850.00
50	Drying plates for the same, with registers ....per kilogram..	4,500	22.00	990.00
51	3 collecting boxes for the coal-heating furnaces, with slides, each		160.00	480.00
52	2 water-pressure engines, including hooping ....each..		800.00	1,600.00
53	3 coal transport carts ....do....		160.00	480.00
54	All the iron parts to a limekiln, with 3 firings and 3 outlets, including tin case and pipe			3,000.00
55	1 coal-boiling apparatus, with 3 barrels of 1,100ʒ and 1,570ʒ height in the direct places complete, with all the connecting pipes below them, and valves, metal slides, tinned wire sieves and collecting pipe			2,700.00
56	1 double chalk-slaking barrel, with clack valves			320.00
57	1 limewater barrel, with fine wrought-iron grate and valve			320.00
58	1 stirring apparatus to the limewater, with wrought-iron barrel			300.00
59	1 lime pump of 22 per cent., with rod			375.00
60	1 filling funnel for the filter			30.00
61	1 filling funnel for the coal-boiling apparatus			40.00
62	1 exhaust-steam box for the Schützenbach apparatus			425.00
63	1 lying working machine with 365ʒ and 328ʒ lift, with patent regulator, including grappling and closing valve			4,000.00
64	1 lying-machine of 300ʒ and 525ʒ lift, with patent regulator, including grappling and closing valve for the sugar house			2,700.00
65	1 lying machine of 235ʒ and 525 lift, with patent regulator, including grappling and closing valve for the coal house			2,000.00
66	1 machine of 157ʒ and 260ʒ lift, including grappling and closing valve for the lime station			900.00
67	2 double-working feeding pumps of 100ʒ and 200ʒ lift, including grappling and closing valve ....each..		1,300.00	2,600.00
68	1 balance water-pumping engine of 365ʒ and 785ʒ lift, with 2 simple working water pumps of 315ʒ and 2 feeding pumps of 105ʒ, including hooping and valve			7,320.00
69	1 balance air-pumping engine of 365ʒ and 785ʒ lift, with 2 air pumps of 420ʒ and 2 heaping pumps of 210ʒ, including hooping and closing valve			8,580.00
70	Special pipes and air chamber........per kilogram..	2,400	32.00	768.00
71	2 pump valves of 210ʒ each, with 1 section bucket......each..		135.00	270.00
72	1 carbonic-acid steam pump of 470ʒ and 525ʒ lift, including hooping and closing valve			4,000.00
73	1 safety valve for the carbonic-acid pump			125.00
74	1 return valve			75.00
75	Various valves with red brass cones and spindles, well-finished wrought-iron columns and wrought-iron fillets, 39ʒ, 52ʒ, 65ʒ, 78ʒ, 92ʒ, 105ʒ, 131ʒ, at 28, 35, 45, 55, 65, 75, 105 marks....each..			5,000.00
76	14 plugs and fermenting tubs ....do....		10.00	140.00
77	1 simple gin with 125-metre chain and roller, with holdfasts to the same to the lime crane			275.00
78	1 gin with double communicator and 12-metre chain, 1 roller with holdfasts to it			375.00

Estimates for sugar manufactory—Continued.

No.	Machinery, fixtures, etc.	Kilograms.	Price.	Total.
	A.—*Machinery and apparatus*—Continued.		*Marks.*	*Marks.*
79	All the cast-iron pipes with turned flanges and bored screw holes in normal lengths .... per kilogram..	17,500	25.00	4,375.00
80	The same in unnormal lengths ....do....	2,000	28.00	560.00
81	Special knee and support pipes ....do....	10,000	32.00	8,200.00
82	8 filters, about 115 to 9,200 kilograms, 5 montages, 1 *retour d'eau*, 3,600 ....per kilogram..	12,800	51.00	6,528.00
83	Sieves and stands to the filters..........................do....	150	0.75	112.50
	Total A	....	....	151,274.50
	B.—*Coppersmith's work.*			
1	*a* 1. Copper vacuum in ball form of 2,040ℓ, with high dome, double bottom, and double worm of 80, respectively, 105ℓ and conus (milling apparatus) of 260ℓ ... ..per kilogram..	2,750	270.00	7,425.00
	b. All the water, steam, and juice valves in triple positions, per kilogram	250	270.00	675.00
	c. Vacuum barrels and complete conus motion, vacuum gauge, thermometer, glass tubes, eye glasses, and India-rubber conus	....	....	675.00
2	1 evaporating apparatus, standing in 2 bodies of together 240 square-metre heating surface, with complete garniture	....	....	15,600.00
3	2 condensators for conus injection .... each..	....	750.00	1,500.00
4	Filtration to 8 filters, consisting in 8 cast-iron pipes, 8 cast-iron outlet knees, 8 brass air cocks, 8 brass 39ℓ knee valves, contra steam, 8 brass 39ℓ kneo cocks and water, 8 brass 39ℓ knee cocks, dam juice, 8 brass 39ℓ knee cocks, thick juice, 8 brass 39ℓ passage cocks, rising, 8 brass 39ℓ outlet valves, with complete copper pipe connection (the pipes below) each	....	650.00	1,500.00
5	Copper worms and knee ....per kilogram..	1,000	270.00	2,700.00
6	Straight copper pipes............................per kilogram..	1,500	240.00	3,600.00
7	Rose copper...do....	1,200	225.00	2,700.00
8	Hard solder ....do....	900	180.00	1,620.00
9	Borax ....do....	200	180 00	360.00
10	Tin...do....	400	200.00	800.00
11	Small copper utensils.....................................do....	300	276.00	810.00
12	Wrought-iron plates..do....	3,000	100.00	3,000.00
13	Various iron screws .... do....	....	....	1,800.00
14	Various screws with turned heads and brass female screws...	....	....	400.00
15	Various brass valves and cocks with red brass cone and cube ....per kilogram..	2,000	270.00	5,400.00
16	Waought-iron pipes, 32, 44, 57, 69, 82, 95, 108, 121, 134½, at 1.65, 1.80, 2.15, 2.70, 3.60, 4.15, 5.55, 7, 0.8, 00 marks per metre	....	....	9,000.00
17	Tin pipes and drying-stove pans, etc...........per kilogram..	3,000	100.00	3,000.00
	Total B	....	....	66,265.00
	C.—*Other articles.*			
	Leather straps, girths, tin buckets, Schützenbach boxes, screws, India-rubber packings, and other minor articles....	....	....	12,000.00
	Recapitulation.			
	A.—Machines and apparatus	....	....	151,274.50
	B.—Coppersmiths' work...	....	....	66,265.00
	C.—Other articles...	....	....	12,000.00
	D.—Unforeseen things...	....	....	20,460.50
	Total	....	....	250,000.00
	Total in United States gold....................................	....	....	$59,590.00

The cost of machinery for a manufactory capable of working up 500,000 kilograms (or 500 tons) daily, will be as follows:

	Marks.
A.—Machines and apparatus	329,271.50
B.—Coppersmiths' work..	294,785.00
C.—Other articles	40,000.00
D.—Unforeseen things	35,943.50
Total	700,000.00
Total in United States gold..	$142,000.50

About 6 per cent. will be added for seaworthy packing and for delivering on board steamer at Bremen.

J. S. POTTER.

UNITED STATES CONSULATE,
Stuttgart, April 5, 1880.

SUGAR-BEET CULTURE IN EUROPE (1884).

REPORT BY CONSUL WILSON, OF BRUSSELS.

The fact that the manufacture of beet sugar on this continent has, within the last few years, grown into such magnitude and become such an element of national wealth, whilst in the United States it has made such little progress, notwithstanding the comparative cheapness of our land and the peculiar adaptation of much of our soil and climate to the growth of the beet, would seem to imply that our cultivators of this plant have either not yet fully appreciated all the conditions necessary to make its culture a profitable crop, or that for some reason our refiners have failed to render it such for them.

However this may be, I here propose to give, in as brief a form as possible, some practical observations on this subject derived from reliable authorities, which may, perhaps, awaken amongst both our refiners and agriculturists an increased interest in what is regarded on this continent as one of the most profitable of soil crops.

AREA CULTIVATED.

There are now no less than 875,000 hectares, or about 2,000,000 acres, of land devoted to the culture of this beet in France, Germany, Austria-Hungary, Russia-Poland, Belgium and Holland, distributed amongst these countries in the folowing proportions, viz: In France, 220,000 hectares; in Germany, 210,000; in Austria-Hungary, 200,000; in Russia-Poland, 180,000; in Belgium and Holland, 65,000 hectares. For Russia and Holland I regret that I can not furnish further statistics relating to their sugar product; but in France there are now 500 refineries, producing annually about 385,000 tons of sugar; in Germany 341, producing 575,000 tons; in Austria-Hungary 245, with a product of 425,000 tons; and in Belgium 156, turning out annually about 100,000 tons. Thus it will be seen that in the four above-named countries the annual product of this sugar amounts to an aggregate of 1,485,000 tons.

CULTIVATION IN THE SEVERAL COUNTRIES.

Germany, undoubtedly, now stands at the head of the beet-sugar manufacturing nations of this continent, for certainly in no other country of Europe has this manufacture developed with such rapidity or into such colossal proportions; and this is generally attributed not so much to the better adaptation of German soil to the cultivation of the beet as to the mode in which this is done and the enlightened fiscal régime applied to the sugar refineries. In Germany and Austria, and, I believe, in Russia also, the excise duty is assessed upon the beet before it enters the refinery, leaving the manufacturer free to convert this material into whatever form he may find the most profitable; whilst in France, Belgium, and Holland it is assessed upon the sugar produced in the refiner-

ies, to ascertain which Government officials are appointed to watch over every stage of manufacture and to see that nothing goes out of these establishments by night or by day, either in the form of crystallized sugar or any other substance containing saccharine matter, without being first submitted to inspection and the imposition of duty. The refiners of this country are not only subjected to the surveillance of these official agents, but are also required to report to the Government the precise day of each year when they intend to commence refining operations, in order that the inspectors may be on hand; and in case they are not ready at that time they are compelled to pay 15 francs to the Government for every twenty-four hours after that date until they begin operations.

GOVERNMENT TAXATION AND ENCOURAGEMENT.

The mode of assessing the excise duty in Germany gives to the sugar-refiners of that country another very great advantage over the refiners of France and Belgium. The German refiner, instead of having to submit to the annoying interference of Government inspectors in determining the duty to be paid according to the grade of his product, is simply required by law to pay an amount equal to 25 francs per ton on all the beets entering his refinery, and when once their weight is determined and the duty paid the Government has no other claim upon him. But this is not all the superior advantages this mode of assessing the excise duty confers upon him. When it first became a law German beets contained about 6 per cent. of saccharine matter, and the excise duty of 25 francs per ton was based upon that fact; but under the present improved mode of selection and cultivation they contain from 10 to 12 per cent., all of which excess may be fairly regarded as clear gain to him. There is still another feature of this manufacture in Germany that accrues to the benefit of both cultivator and refiner well worthy of consideration. A very considerable number of the refineries in that country are now organized and incorporated as coöperative companies. In other words, the large and small cultivators of the beet in certain districts have built refineries upon the following joint-stock plan, viz: After determining the probable cost of their contemplated refineries, shares of stock are issued, payable in installments, to cover the expense incurred, and each stockholder obligates himself to furnish to the refinery an annual quantity of beets, proportioned to the stock he has in the concern, and as every stockholder obligates himself to furnish to the refinery an annual quantity of beets proportioned to the stock he has in the concern, and as every stockholder, whether large or small, is dependent upon the product of the refinery for quite a portion of the profits of his cultivation, it may be readily imagined that he leaves nothing undone in the way of cultivation to bring his beet crop up to the highest possible standard of both quantity and quality. Indeed, there can be but little doubt that this class of sugar-manufacturing associations

has done more to perfect the beet-culture in Germany than any one other element whatever; and that the Germans have found this a profitable industry I need only here to mention that seventeen new refineries have recently been built, thirteen are in process of construction, and projects are now on foot for the building of no less than fifty more, which will necessitate an increased beet-culture of more than 50,000 hectares. In a recent report made to the German Reichstag, Herr Richter, a deputy from Hagen, made the statement that in 1881-'82 no less than 100,000 tons of beet sugar had been exported from the country, thus escaping 25,500,000 francs excise duty that otherwise would have gone into the public treasury. The remission of this duty to the German refiner on all the sugar he exports is of vastly more importance to him than is a similar remission to the French and Belgian refiner, seeing that it is assessed upon his beets, calculated to contain 6 per cent. of sugar, whilst they really contain from 10 to 12, the value of which difference becomes to him an export premium paid him by the Government. Indeed, it is thought here in Belgium, and in France also, that if to the present number of refineries the new ones contemplated in Germany should be added, within two years the product of German sugar will amount to 1,000,000 tons, and that of this quantity there will be about 600,000 tons available for foreign exportation, which, with their premium-paying excise duty and their superior mode of cultivation, will enable them to largely monopolize the sugar markets of the continent and seriously cripple this industry both in France and Belgium, unless these Governments come to its aid in one form or another.

MODE OF CULTIVATION.

The cultivation of the beet throughout France, but especially in Germany, is being constantly modified with a view to better results, both as to the gross yield of roots and the quantity of saccharine matter they contain. The climatic conditions and chemical qualities of the soil where it is proposed to plant are carefully and scientifically studied, and after these have been found satisfactory the preparation of the soil, class of fertilizers, mode of planting, and the variety of seed selected receive an equal amount of consideration.

On the subject of climatic influence it is an established fact that no locality where the length and heat of the growing season are such as to force the plant into a seed-bearing stem the first year is fit for the cultivation of the beet for sugar, seeing that the rapid development of its organic structure into this degree of maturity always involves a marked decrease of saccharine matter. It would seem from the reports of the most scientific and competent observers that during the early growing season of April and May this plant requires but a moderate degree of both heat and moisture; but in June and July, when it is maturing its foliage and form, a much greater degree of both is necessary; and, finally, that during August and September, the period for the elabora-

tion of its saccharine matter, it requires uniformly dry heat. If much humidity prevails at this season the plant will continue to develop its foliage and become deficient in saccharine qualities and consequently more or less of a failure.

The quality of the soil and the mode of its preparation are also elements of the first consideration in this culture. It is now, I believe, generally admitted that neither a sandy nor a hard clay soil destitute of calcareous matter, nor yet one too highly charged with light, porous organic matter, is favorable to saccharine development in this plant. In short, without entering into a detailed description of the various soils recommended, it may be said that the soil best adapted to the production of wheat and rye in a due proportion of a strong straw and perfect grain will suit this beet well.

But however favorable the climate or naturally well adapted the soil may be, if a due regard is not had to its proper preparation before planting, a good and paying crop can not reasonably be expected. It is a chemical fact that (all other conditions being equal), for the fullest development of saccharine matter in this plant, it must possess a good tap-root and a smooth, well-proportioned form; hence it matters not how rich in proper chemical constituents the soil may be, if it has not been plowed to a sufficient depth to allow the tender tap-root to prolong itself downward it will be forced aside and the plant will at once throw out additional roots to attach it to its base. The downward growth being thus obstructed, the body of the root is unduly pressed above the surface of the ground, and this, with the straggling lateral roots it is forced to throw out, destroys its symmetry of form and invariably results in diminishing the elaboration of sugar in the plant according to its weight. On all successful beet-growing farms on this continent the soil is turned and opened to the depth of at least 20 inches, and this is always done when possible in the autumn preceding the spring planting.

On the subject of the best variety of beet to be selected for planting, it may suffice to say that, whilst the sugar-producing qualities of almost all (and there are many) have been improved within the last few years, it is an admitted fact that there is no variety especially superior to the others in its adaptation to the various soils and climatic conditions of all countries, and that the safest method to pursue in this matter is for each cultivator to grow, from selected plants of known sugar-producing quality, his own seed, and thus secure an acclimated variety suited to his locality. A vast number of methods have also been invented for determining the germinal quality of the seed intended for planting by the cultivator, but a knowledge of the maturity of the seed-bearing plants furnishing the seed and a proper regard to the form and relative weight of the seed will, in most cases, be sufficient to guard the farmer against any errors in this direction.

FERTILIZERS FOR BEET-CULTURE.

The subject of fertilizers for soil devoted to this culture has also claimed much attention from the beet-growers of this continent, and is, I think, now well understood. Formerly it was thought by farmers that a plant so charged with sugar was necessarily an exhaustive crop to the soil, but chemistry coming to their aid demonstrated to them that as sugar was composed of carbon, hydrogen, and oxygen—all derived from the air and water—it was one of the least exhaustive crops they could plant, and such, indeed, is the fact; for if, after the extraction of the sugar, the pulp, with the neck and leaves of the plant, were restored to the soil upon which they grew, there would only remain to be restored to it, of its original constituents, but a small amount of phosphates, lime, potash, and soda, in order to bring it up to its original fertility.

But the question with intelligent beet-growers now is not how they may best guard against an exhaustion of their soil, but how they may secure from it the greatest weight of roots containing the highest possible degree of sugar; and here again chemistry has come to their aid. It has been satisfactorily established that to produce 50,000 kilograms of beet roots, yielding 12 per cent. of sugar, upon a hectare of land, the soil must contain at least 60 kilograms of phosphoric acid, 100 kilograms of lime, 90 kilograms of magnesia, 200 kilograms of potash, and 120 of azotic or nitrogenous matter; but, as all soils contain more or less of these agents, this quantity need not necessarily be added to many of them to secure the above-named crop.

However, as a basis of calculation to serve as a guide to the cultivator, it is assumed that to any given natural soil that will produce 15,000 kilograms of beets, yielding 10 per cent. of sugar, two-thirds of the above amount of fertilizers should be added to secure a yield of 50,000 kilograms of beets of 12 per cent. sugar constituents. Hence, to produce a crop of this beet yielding 6,000 kilograms of sugar per hectare, on a soil previously more or less exhausted, the following formula of fertilizers has been advised, viz: Hyperphosphates of lime, 400 kilograms; sulphate of lime, 200 kilograms; chloride of potash, 250 kilograms; nitrate of soda, 350 kilograms; sulphate of ammonia, 150 kilograms. This is what is here called intensive fertilization, and is now resorted to in some modified form, according to the original quality of the soil or the rotation of crops grown upon it, in all the large beet-growing districts on this continent.

Stable manure, which generally contains a large proportion of nitrogen, is rarely used as a fertilizer for a crop of beets immediately succeeding its application, in consequence of its stimulating too much the growth of organic matter in the plants at the expense of saccharine qualities; but, when wheat or rye is sown in the autumn in a soil thus fertilized, a good crop of beets may generally be expected from it the next year. In the environs of Lille, near the southern frontier of this

country, it is not an unfrequent thing for the farmers, by the free use of this strongly nitrogenous fertilizer, to grow upon a single hectare of land 100,000 kilograms of beets, but the roots, whilst unusually large, are cavernous and spongy and greatly deficient in sugar. Seeing, however, that not only in France, but in Belgium and Holland also, the cultivators sell their beets to the refineries at a price agreed upon per ton and have no further interest in the sugar product, this kind of fertilization continues to be more or less practiced in these countries; but in Germany, and especially among the coöperative cultivators, who have a double interest in their crops, it is generally repudiated, for, as the standard price per ton allowed for their crop is determined by the ascertained quantity of the sugar it contains, they have no motive to raise beets deficient in this matter, and especially as the Government levies a tax equal to 25 francs on every ton of beets that enters the refineries in which they are stockholders, regardless of quality.

MODE OF PLANTING.

Amongst successful beet-growers here there still exists a difference of opinion as to the mode of planting adapted to the product of the best crop, some advocating the sowing of the seed in rows on a flat surface and others on elevated ridges. The latter mode, however, is now the more popular, and is in Belgium almost universally practiced. After a due preparation of the ground, the planting is done by a machine depositing the seed in ridges about 2 feet apart, previously made; and when the plants begin to show well upon the ground they are thinned out, so as to leave from 10 to 12 inches between those intended to remain. Whilst there are many advocates for larger spaces between the rows, and also between the plants in the row, from all I can learn, this plan, in a soil moderately rich, affords ample room for cultivation and produces the best results. The subsequent cultivation consists in destroying all weeds that may grow either between the rows or the plants in the row, and of loosening the soil and banking it up to the plants by small cultivators and plows adapted to the purpose; and the more frequently this is done during the growing season the better the prospects of a good crop will be.

BEET-CULTURE IN THE UNITED STATES.

As the subject of net profit from any kind of agricultural industry is the one which usually determines its adoption or rejection in every country, the question for our American farmers to determine in regard to this cultivation is: Does it pay or can it be made to pay? The answer to this interrogatory involves a number of considerations that must here be mentioned. However good the crops our farmers might be able to raise, they could not profitably dispose of them unless there were refineries to purchase them, and, unless the manufacture of sugar from the beet can be made a profitable industry in the United States,

refineries will not be built; hence the difficulty in attempting to resolve this question.

Of the paying results to the limited number of refineries now in the United States I have no knowledge and therefore can not venture an opinion upon the subject, nor have I any reliable data from which to judge of the profits of the continental refineries, seeing that this is, as much as possible, kept a secret of the craft; but as all beets raised by the farmers are freely bought by the refiners it is fair to assume that the manufacture of sugar from them is profitable, otherwise their cultivation would soon cease.

PROFITS OF CULTIVATION.

The following facts showing the relative yield and value of some of the chief agricultural products of Belgium will, at least, indicate how the matter of profit stands with the farmers in this country. The average yield of wheat, per hectare, is 1,675 kilograms; of rye, 1,460; of barley, 1,830; of oats, 1,500; and of beets, washed and cleaned ready for the refinery, 35,000 kilograms. The average price of wheat is 28.50 francs per 100 kilograms; of rye, 23; of barley, 21; of oats, 19.80; and of beets, from 20 to 25 francs per ton. The estimate will give, per hectare, the following cash values of these respective crops, viz: Wheat, 477 francs; rye, 433; barley, 384; oats, 315; and beets, about 800 francs. Thus it will be seen that a hectare of beets will yield a cash value of 322 francs more than wheat, 367 more than rye, 416 more than barley, and 484 more than oats.

I am not able to give the exact proportionate cost of the cultivation of these crops in this country, but it may be accepted as a fact that the cultivation of a beet crop does not, by any means, involve an increased expenditure of money equal to the increased value of the crop raised over that of any of the cereals just named. From data now before me I fortunately can give an exhibit of the average cost and profit of this crop in Germany, and for this purpose have selected the following figures, taken from an estimate made in the Duchy of Brunswick, where all the conditions of price of land, soil, climate, and cost of labor are probably as well adapted to this purpose as any other.

Expense of cultivating per hectare.

	Francs.
Seed and preparation of the soil	140
Plowing, harrowing, and other cultivation	183
Artificial fertilizers	150
Rent paid to proprietor	150
Total expenses	623

Receipts per hectare.

	Francs.
28,000 kilograms of beets, at 27.50 francs per ton	770
35 per cent. of pulp, at 10 francs	98
Leaves and neck of plants for cattle food, valued at	50
Total receipts	918
Deduct expenses, including rent	623
Balance of profit to cultivator	295

This I doubt not would be as correct an average estimate of cost and profit for this entire continent as could well be made, and with it I leave the whole subject to the consideration of whom it may concern, merely remarking, in conclusion, that if in any country this can be made a profitable industry it ought to, if scientifically pursued, be made so in the United States, where so much of both soil and climate favorable to it abound.

JNO. WILSON,
Consul.

UNITED STATES CONSULATE,
Brussels, February 15, 1884.

MANUFACTURE OF RAW SUGAR FROM BEET ROOTS (1888).

REPORT BY CONSUL FALKENBACH, OF BARMEN.

The beet roots, which have been planted with the object of sugar production, are first of all conveyed, when their leaves have been removed, into the yard of the sugar factory. Here they are thrown into a canal (*a*) provided with descents in brickwork, or with metal gutters, through which they are borne by the rushing water into the washhouse, which constitutes the first stage of the factory.

This beet conduit may be situated with advantage in a building known as the beet-root cellar, or beet-root house (*b*), whereby the beets are protected to some extent from the influence of the weather.

In place of the beet conduit a horizontal belt transporter is sometimes employed, but it must be invariably roofed over. A distinct advantage of the beet conduit over the transporter is that in the former the beets are not alone transported but also freed in the water from a portion of the impurities attaching to them without any being incurred.

These conveyers, whether of mechanical or hydraulic construction, bring the beets, as above stated, into that chamber of the sugar factory—the washhouse—which is utilized solely for washing purposes. The washing of the beet constitutes a very important element in the manufacture of sugar, for the beets are thereby freed from mold, small stones, and other kinds of dirt attaching to them, and in consequence not only is the machinery employed in the actual preparation of the beets preserved from injury but the sugar ultimately obtained is kept free from

impurity. So soon as the beets have been brought into the washhouse they are thrown into the washing machine by means of a raising wheel or a chain pump, or through a spiral passage (*c*) placed aslant. The last-named method has this special advantage, that it serves to wash as well as to convey the beets, and permits of the raising within an hour both the beets and water in which they are contained.

There are two kinds of washing-machines, the drum-washer (*d*) and the bar-washer (*e*). The former consists of a cylinder rotating upon its own horizontal axis; the latter of an arm, or bar, likewise turning on its own horizontal axis. Both are mounted in a trough provided with cocks for admitting and leading off water, and in both there is a stone-catcher.

In the washing apparatus the chief aim is to bring the beets as much as possible into contact with pure water, so as to be washed clean. The dirt and stones detached from the beets are deposited on the floor of the stone-catcher, or receiver, fixed to the back part of this machine, from which they are from time to time emptied out from below; the beets, however, are conveyed by a contrivance constructed for the purpose from the washing apparatus into the stone-receiver, by the arms of which their further transport is effected. The greater the area of the wash-machines the more thoroughly are the beets cleaned. It is advisable, therefore, to have two washing-machines placed one after another, and best of all two bar-washers, or one bar-washer and one drum-washer.

In order to reduce the consumption of water in the sugar factory to the lowest possible figure, the water condensed from the steam given off from the boiling apparatus in the factory is utilized for the purposes of the conduit and washing the beets.

The employment of this condensation water, which has a temperature of about 35° C., adds considerably to the effect produced by the washing machine, and is quite indispensable when frozen beets have to be washed. In case the quantity of condensation water obtainable should prove insufficient it must, of course, be supplemented by the addition of fresh, cold water.

With the mere washing of the beets the manufacturer is not content; provision is therefore made for the beets to be freed from those parts which are poor, or at least not so rich in sugar as the others, before the process of extracting the juice begins. With this object the greenish upper part of the beet is cut away. This measure is of great importance in Germany, for in that country the tax paid to the State by the sugar manufacturer on his productions is assessed on the weight of the beets, so that he would be obliged to pay on the same scale for the portions which contained but a poor percentage of sugar as for the rest. In other countries, where the method of taxation is different, less importance is laid upon the removal of the green beet tops, and these are manufactured with the whole remaining portion.

For the purpose of removing these tops and the pebbles and dirt which may have been torn up with them, as well as any rotten parts which the beet may contain, a caroussel (*f*), or broad transporter, is placed so as to receive the beets, which are thrown into it from the washing machine by means of the arms of the stone-receiver. This transporter is of wire and moves at a low rate of rapidity, so that the workwomen beside it can cut each beet and, as far as they are able to see, to remove with facility the rotten parts, the small stones, and all foreign bodies. The caroussel is a circular sieve placed horizontally, through the apertures of which the water, of which a certain quantity is thrown in from the washing-machine, may run out. Around this caroussel, which moves very slowly upon its center, workwomen are also placed and perform exactly the same work as in the case of the transporter above mentioned. After passing under this thorough revision the beets are conveyed automatically from the caroussel to a perpendicular or slanting chain-pump (*g*), which provides for their passage from the wash department to the diffusion chambers.

The waste, which the workwomen have separated out, is invariably put aside. There two kinds of chain-pumps, the dredge-pump and the chain-elevator, both of which consist of a number of cup-like vessels, which receive the beets from the caroussel and deposit them in a box called the beet-collecting box. They are distinguished from one another only by the kind of connection—belt or chain—between the different cups. The term collecting box is sufficient to explain that the beets are collected in this receptacle when the washing process is complete. Thence they are conveyed by separate lots in trucks running upon rails over a weighing machine (*h*), there weighed, and then drawn to the cutting or slicing machine (*i*), into which they are transferred.

In Germany the weighing of the beets takes place under the control of the revenue authorities, and is to be recommended for factories in countries where a different system of taxation, or none at all, prevails, for solely by this means is the sugar manufacturer enabled to ascertain the exact quantity of beets manufactured each day. Only the approximate weight of the beets can be arrived at by weighing them as they come from the field. Dirt and all other impurities removed during the washing process are, of course, valueless, but often amount to 30 per cent. of the weight of the beets. A previous weighing can, therefore, only serve the purpose of fixing the original weight of the quantity of beets employed for the sake of estimating the price. With the above mentioned cutting-machine we have reached one of the principal stages of actual sugar manufacture, namely, the point at which the process for obtaining the juice comes under consideration. The system most generally adopted, and the one solely employed in new factories, is called the diffusion system (the manipulation of the beet root in slices), and is the only one which we propose to consider now.

As the sugar juice, which it is intended to obtain, is contained in the

cells of the beets, it is necessary to bring as many of the cells as possible into contact with water so that the latter may dissolve out the juice, an effect which is rendered possible by applying the process of diffusion to the beets after they have been cut up into slices. The laying bare of the interior cells of the beets, which is produced by cutting the beets up into thin slices or lumps, is effected mechanically, namely, by means of the slicing-machine, which is thus seen to be one of the chief factors of the diffusion system. The slicing-machine consists of a disk, rotating horizontally on its own axis, and fitted with knives. By means of the rotation the knives catch the beets which descend upon them and cut them up into thin circles. The slices slip down beneath the knives and fall into a transporter placed to receive them. The most celebrated and therefore the most generally employed cutting-machines are either stationary or depending, and driven by transmission gearing. Other kinds are known, but these are of inferior excellence.

The knives employed are of very various construction, such as rib knives, goller knives, roof-rib knives, anchor knives, etc. If the beets have not been properly washed, and foreign, hard bodies, such as iron, stones, and such like, are brought into the cutting-machine, its knives are seriously damaged. These must then frequently be changed and sharpened and an interruption of the factory operations is the result. The cuts are also rendered bad thereby; they become irregular in shape, and it may be said that the diffusion suffers in consequence from indigestion. Hence the warning which must be given to expend as much care as possible upon the beet wash-house. The transporter into which the slices fall from the cutting-machine is called the filling transporter (*j*), as it serves to fill the diffusion vessels. This filling transporter is so arranged that one or the other of the diffusion vessels can be filled at will (in correct manufacture by rows), and is constructed of either a straight or a circular shape, according to the arrangement of these vessels.

We have now come to the diffusion vessels, but before entering upon a detailed description of them we will first explain the nature of the diffusion which takes place in them. By diffusion, or osmose, is understood the process of exchange which goes on between two different kinds of fluids of unequal degrees of density, contained in two different vessels, connected by a membrane. This diffusion, which takes place through a membrane, is called membrane diffusion, to distinguish it from free diffusion, which takes place freely, that is, without any membrane.

The beet juice is contained in the cells of the beets and each one of these cells is covered by a membrane. In this case, therefore, a membrane diffusion between two fluids—the juice in the cells and the water in which they are rinsed—is the only diffusion possible. In the case of the sliced beets, the large quantities of cells contained in them must be considered, the process of diffusion being here somewhat different than when only a single cell is concerned.

In order to comprehend the process, let us imagine a number of cylinders tightly closed together on their circular surfaces, and with their contents for the present moment separate. This complex of cylinders, which are filled with juice, is hung in a vessel filled with water. The diffusion naturally takes place, first of all, with the two extreme cylinders, and then gradually advances from both sides towards the middle, until the juice in all the cells or cylinders has acquired, by means of exchange, the same density as the surrounding fluid in the vessel (originally water). When this has taken place the diffusion is at an end, but it can be repeated after the whole of the fluid, now of the same density, has been drawn off. In this way the cylinders can be lixiviated by constantly changing the fluid: also, new and additional complexes of cylinders can be lixiviated, when the drawn-off fluid is repeatedly re-employed. In the latter case a higher density or concentration of the drawn-off juices is obtained. By this method the saccharine juice is extracted from the sliced beets. If now, instead of the vessel filled with water, a diffusion-vessel be imagined, and, instead of the cylinder filled with saccharine juice, the cells in the sliced beets, which are conveyed from the cutting-machine to the diffusion vessels in the filling transporter, we have a mechanical explanation of the entire diffusion system.

Temperature is a most influential factor in the diffusion process, for the higher it is the more rapid is the diffusion. At the same time it is not advisable to exceed certain proportions. In order to preserve the required temperature in the vessels in which the diffusion is taking place, fore-heaters, or calorisators, are employed.

It is not the object of these lines to describe in the minutest detail the nature of the diffusion, so that, after the above brief explanation, we turn back to the point at which the sliced beets are supposed to arrive in the diffusion vessels.

The diffusion apparatus (*k*), or, to put it shortly, the diffusion, consists of ten to twelve vessels (the diffusers), as many fore-heaters, or calorisators, and the necessary valve and tube fittings.

The complete diffusion apparatus is called the diffusion battery, and this can be constructed, according to arrangement, with vessels in one or two rows, or in a circle. If the diffusion battery is of one or two rows, the shape of the filling transporter is straight, and the cutting-machine can be placed at the side of the battery. In case of circular diffusion, the filling transporter must also be circular, and the cutting-machine is placed either inside or outside the circle of the vessels, or in the center, in which case it is rotatory on its axis and fills each diffuser itself, so that a filling transporter is superfluous. In rare cases the entire diffusion battery rotates round the cutting machine.

The diffusers are cylindrical vessels placed in a vertical position, with water tight and hermetically-closing covers. In their upper apertures

slices are thrown in from the filling transporter, and thus the diffuser is filled. Below, the diffusers are closed either by an hermetically-shutting lid or manhole, to empty the vessels of the lixiviated slices when the diffusion is completed. The filling of a diffuser with fresh slices lasts from 7 to 10 minutes, according to its size. With a battery of twelve vessels, one is always being filled and one emptied, while the remaining ten are operating. The diffused juice (about 60 per cent. in volume of the contents of the diffuser) is obtained by adding fresh, pure water under a pressure of one to one and one-half atmospheres to that diffuser which is about to be emptied. The water is drawn from a reservoir (*m*) high enough to produce the required atmospheric pressure, and into which it is raised by means of a water-pump (*l*). By separating out, by means of a compression pump (*m i*) applied from the last diffuser but one, the juice collects and leaves the diffuser, which is being filled with fresh slices, with a condensation of about 11 degrees Brix, and at a temperature of about 30 degrees C. This temperature is attained by the application of a system of pipes filled with steam. In these pipes circulates the juice, which streams through from diffuser to diffuser, and which is thus previously heated. These pipes constitute the above-mentioned fore-heaters, and the extent of their heating surface is in accordance with the length of time consumed by a diffuser in acquiring the necessary grade of warmth, and the extent of the difference of temperature between the steam and the juice.

In the first six diffusers the juice is always maintained by fore-heating, at a temperature of about 70° C., but from this point the temperature declines, so that the last diffuser which is emptied has a temperature of about 30° C., and can therefore be manipulated.

The quantity of juice drawn off from time to time is always a constant one. Continuing its journey, this diffusion juice arrives in a fore-heater (*n*), in which it is heated to 60° or 50° C., by steam produced in the last vessel of a steaming apparatus, which we will describe on a subsequent occasion. After this the juice arrives in a second fore-heater (*o*), which is heated with the spent steam of the steam-engine, and is there heated to 90° C., and is then conveyed into a measuring cask (*p*).

Before passing on to the further process of manufacture, to which the juice now obtained is subjected, we will turn back once more to the diffusion battery, in order to follow the road which is taken by the residue remaining over from the diffusion.

The juice having left the diffusers, the latter contain only the lixiviated slices, which have been deprived of the greatest portion of their juice. By opening the lids or manholes at the bottom, the slices are emptied out of the diffusers, and this operation takes place in the same order as the previous lixiviation. The diffusers are also rinsed out and filled with fresh slices. The lixiviated beet slices, which fall below, are received either in a brick gutter placed aslant and washed

into the slice-presses by the water pouring out with them, and in which they have been rinsed, or they are received on a transporter (*q*), the shape of which is in accordance with the construction of the diffusion battery, and which, from time to time, runs beneath it and conveys away the slices to the presses.

If the presses are not set up immediately beneath the diffusion battery, but above it, the slices must be conveyed by means of an elevator (*r*) from the battery to the presses. There are various kinds of slice-presses, the construction of which differs. They all, however, have the object of separating, as much as possible, the water contained in the slices, and which amounts to about 95 per cent., so that the slices may be utilized as fodder for cattle. The water extracted by the presses is not supposed to contain more than 3 per cent. of sugar. If it should be proved that the percentage is higher, more care must be expended on the diffusion process, and either a better lixiviation of the slices must be effected or the water remaining over from the previous lixiviation must be retained in the diffusers and the latter filled with fewer slices.

Latterly it has been found possible to dry the lixiviated slices very thoroughly by a means of a slice-drying apparatus, the employment of which has proved highly profitable. The quantity of matter resulting from the drying process has thus been raised to its maximum, an effect not previously attainable by means of the presses. The drying of the slices has raised their value considerably as fodder, for the surplus water which they would otherwise contain interferes with the nourishment of the cattle; moreover, wet slices easily become rotten.

Let us now return to the diffusion juice, which we had accompanied as far as the measuring cask and there left. In the measuring casks a fixed quantity allotted one diffuser is measured off and allowed to run out for saturation. Saturation, or separating out, consists in the treatment of the diffusion juices with lime and carbonic acid, whereby the nonsaccharine substances are partially precipitated and partially decomposed, the remainder being preserved unaltered in solution. These nonsaccharine, *i. e.*, foreign, substances are present in the juice in considerable proportions and interfere with the crystallization of the sugar, which they can, in fact, actually prevent; and for this reason pains must be taken to remove them from the juice.

There are three processes of saturation. For the first saturation (*s*) the diffusion juice is brought from the measuring cask at the same temperature as that obtained in the foreheaters, through which it has already passed. It is then mixed with the milk of lime of a concentration of 20° Beaumé, in the proportion of about 2½ per cent. of lime to 97½ per cent. weight of the beets. The action of this milk of lime is to decompose the juice and to combine with various organic substances (nonsaccharine), which are thereby separated out from the sugar juice. The lime is immediately afterwards precipitated by means of carbonic

acid, whereby a certain quantity of nonsaccharine substances are mechanically precipitated, too, and the fluid, originally thick and clouded, becomes perfectly clear and bright. The first and also the two subsequent stations are conducted in a number of circular or polygonal vessels.

The process of saturation being complete the juice is drawn through sand-catchers (*t*) by means of a lye pump, which conveys it under pressure into the filter presses (*u*) of the first saturation, where the precipitated substances or lye is received.

The filters, or lye presses, are classified according to their construction as chamber and frame filter presses. They consist of a number of four-cornered plates (in the case of chamber presses) or of plates and frames (frame presses), over which cloths are stretched. The lye is deposited between the plates or in the frames, while the fluid passes through the cloths before leaving the press, and is thus filtered. This juice as it flows out passes through foreheaters, in which its temperature is raised to about 25° C. preparatory to undergoing second saturation (*v*). It is then treated once more with milk of lime in the proportion of about 1½ per cent of lime to the beets, then saturated, and afterwards drawn once more through a sand-catcher by means of a second lye-pump (*w*), and pressed into the filter presses of the second saturation. There the juice passes through exactly the same process as in the first presses and flows out to undergo the third saturation (*y*).

Previous to the third saturation the juice is warmed by means of foreheaters to about 15° C. and then treated in the saturators with sulphurous acid, which is obtained by burning sulphur in special sulphur-kilns, constructed near to the saturators, and which is forced into them by means of a pump. After the third saturation the juice is conveyed, by means of a third lye-pump, through a third sand-catcher (*z*), and then forced into the filter-presses of the third saturation. There the precipitate is also deposited as lye, while the juice left over is raised at a concentration of about 9° to 10° Brix into a reservoir (B), placed above, for containing the diluted saccharine juice, by means of a pump (A) specially employed for this purpose.

The lye which has been left behind in all the three filter presses is first of all washed in clean water under pressure from the same reservoir used in the process of diffusion. This water is then added to the juice contained in the diffusers and undergoes the same process to which the juice is subsequently subjected, or it is conveyed by means of a small pump direct into the reservoir in which the diluted juice is contained. The lye contained in the presses is subsequently submitted to an evaporating process, but this measure is not absolutely necessary. The presses are opened and the lye transferred from them on a small carriage running underneath or in a transport worm to the lye-wagon, or it is thrown down the lye transport-worm and then removed from the factory. The lye still contains at this stage about 5 per cent. of

sugar and constitutes a serviceable product in agriculture as a fertilizer. Among its component parts are phosphoric acid, albumen, and a quantity of lime. The question now presents itself, how do we obtain the required milk of lime and carbonic acid?

These two products are obtained together from a limekiln (*C*). This limekiln consists of a hollow circular chamber of incombustible material, provided with furnaces and delivery apertures, and is generally placed in the open air in the factory yard, or in what is known as a "closed building" The lime and the carbonic acid are obtained in this kiln by calcining limestone (or chalk). The limestone destined for this purpose is drawn up in an elevator (*D*) to the highest point of the kiln or "mouth," as it is called, and through an aperture in this mouth, provided with a lid, is thrown into the kiln alternately with quantities of coke. The coke is added to accelerate the calcination of the limestone. By means of this calcining process the carbonic acid, also obtained as a lye product, collects in the uppermost parts of the kiln mouth and is pumped out by means of an air-pump, which is known as the carbonic acid gas-pump (*E*), and which is placed inside the factory.

The pump-conduit, which connects the pump with the kiln, passes on its way through a washing-vessel (*F*), the object of which is not only to cool the carbonic acid, but to free it from all impurities with which it may be mixed, such as dust, but above all from sulphurous acids. The carbonic acid gas obtained from the limekiln is mixed in the proportion of about 23 per cent. of pure carbonic acid with large quantities of nitrogen, superfluous air, sulphurous acids, and steam.

The washer is a cylindrical or conically-shaped vessel, filled to about half of its depth with water, above which there is a perforated plate supporting pieces of limestone. The carbonic acid gas is conveyed through a small tube into the water, and when it has passed through both the water and the sieve it is pumped, by means of a carbonic acid gas pump, through a desiccator, in which the water caught up in the washer is retained. The gas is then pressed into a receiver and thence transferred to the saturators.

The calcined, or quicklime, is drawn off in strata from the openings at the bottom of the kiln and allowed to cool in the open air. As soon as possible, when cooled, the lime is slacked with pure water, and with the aid of a lime-slacking apparatus (of various construction), the resulting milk of lime (at about 20° Beaumé) being passed through a sieve, which retains the impurities. The milk of lime is then transported, by means of a pump, to vessels specially placed for its reception above the saturators. The diluted juice, which we left in the reservoirs, is there warmed by steam, and is then run into the evaporating apparatus (*G*). In the evaporating apparatus the concentration of the diluted juice is carried out; for, after the diffusion, this juice has been diluted to about 9° or 10° Brix by the addition of the milk of lime and the sweetened water from the filter-presses. The temperature of the juice,

when it arrives in the evaporating apparatus, where it receives a temperature of 50° Balling, is about 75° C. The concentration of the diluted juice is effected by evaporating the water which it contains.

The evaporating apparatus consists of one or more vessels, according as its effect is single, double, triple, or quadruple, etc. The more vessels there are in the evaporating apparatus the more economically it works; that is to say, the greater is the economy of steam. Not alone, however, does an economy of steam result from employing the greatest possible number of vessels, which, of course, represents the maximum heating surface, but there is a further and consequent economy of coal in the boiler-house, while the heating of the apparatus is effected mainly by slightly rarefied steam of about 1½ atmospheres, and also by the spent steam from the steam engines. The steam, moreover, which proceeds from the boiling juice in the first vessel, serves to heat the second vessel, and so on through the entire series. Owing to the decrease of pressure in the evaporating apparatus, the boiling point is lowered. Water which boils, under normal conditions, at 100° C., boils at a lower temperature when the pressure upon it is less. If it be desired to keep the boiling point constant, the pressure of the increasing concentration of the juice must be lessened. As an example for illustration let us take the quadruple effect. In a quadruple effect, about a quarter of the quantity of water contained in each vessel is evaporated; in the case of a triple effect, one-third, and so forth.

It is thus seen that the concentration increases from vessel to vessel, and in the particular instance we are discussing reaches its highest point—50 per cent. Balling—in the fourth vessel. The steam produced by the evaporation of the water in the first vessel streams into the heating chamber of the second vessel, which it heats, at the same time that a portion of the water of the juice (as already stated, about the quarter of the total quantity of water to be evaporated) is likewise converted into steam. This steam heats the chamber containing the second vessel, evaporates the water again, and the resulting steam finally heats the fourth vessel, whence the steam produced by the repeated evaporations is let free. The first vessel, however, is heated with steam of about 1½ atmospheres.

The vapor produced by the evaporation of the juice in the first, second, third, and fourth vessels, and so forth, leaves the last (in the special case considered above the fourth) vessel at a temperature of 60° C., and can be economically employed for heating the first fore-heater, through which the diffusion juice passes previous to saturation. The vapor can then be condensed. The juice, which has attained to a certain concentration in the first vessel, is then drawn off into the second, then into the third, and finally into the fourth vessel, where it is concentrated to 50 per cent. Balling, and henceforth known as concentrated juice.

The quadruple effect here described, inclusive of the heating of the

first fore-heater, which receives the diffusion juice by means of the vapor proceeding from the evaporating vessel, is a very simple affair. Highly complicated combinations may, however, be arranged, and it is possible to further utilize to some extent the vapor proceeding from the first, second, third, and fourth vessels of the quadruple apparatus which we have been describing, and even to employ it according to need or desire for fore-heating or evaporation—that is to say, decoction. The construction of these evaporating vessels is of various kinds. As a rule, however, they consist of cylindrical vessels, either in a vertical or a horizontal position, and provided with a system of heating pipes. Latterly the Wellner-Felinck system has been most generally employed, and its capabilities have as yet been unsurpassed by any other system. In this apparatus the vessels are of a box shape and are fitted with horizontal heating pipes. As an example, it may be stated that one square meter heating surface in a quadruple apparatus of this system suffices to evaporate 22½ kilograms of the water contained in the juice in one hour, while with other evaporating apparatus the maximum weight is 17 kilograms. In order to evaporate 100 kilograms of water from the juice 26½ kilograms of steam are required by the Wellner-Felinck apparatus.

It is clear, then, that with this apparatus the greatest economy in steam and, therefore, in the coal required for the boiler is, up to the present date, attainable.

The steam which streams through the heating system of the various vessels in any kind of evaporating apparatus is invariably condensed to water. In order, therefore, to prevent this condensed water from filling up the entire heating system in the course of time and thus hindering the heating surfaces from operating, some means must be found for getting rid of this water, and this is done in the following manner:

From the first vessel of the evaporating apparatus, whether the latter produce a quadruple or a triple effect, the condensed water obtained from the spent steam or direct from the boiler steam passes into a tightly-closed receiver, in which all the remaining waste water from steam of approximately the same expansion throughout the entire sugar factory is collected. This receiver is known as the waste-water tank, and is provided with an automatic or ball cock, which regulates the outflow of water and any accompanying outflow of steam. The water collected in this waste tank is conveyed by means of a pump into the feed-water tank, and being at a fairly high temperature serves for feeding the steam-boiler. From each of the other vessels of the evaporating apparatus the condensed water flows into a special vapor receiver, is thence pumped through a ball cock (*H*) valve (to prevent any steam coming, too) into a reservoir, and may then be employed for slaking lime, for feeding the boiler, or, finally, in the beet conduit, and for washing the beets.

The evacuation of the heating system in the evaporating apparatus

is effected by means of small tubes leading from one vessel to the other and connected with the condenser. The vapor receivers are also evacuated by means of small tubes and the air contained in them is also passed into the condenser.

The evaporating apparatus itself is freed of air by the aid of an air pump (*I*), which is required for bringing the juice to a boil at a lower temperature than 100° C. The air pump, however, is not connected directly with the evaporating apparatus, an additional vapor receiver being inserted in the exhaust tubes, in which the vapor from the other boiling apparatus—which still remain to be described—collect, together with the vapor from the evaporating apparatus, and pass into a condenser. Here they are condensed by the injection of cold water from the reservoir, which was previously made use of in the diffusion process. This condensed water is employed in the initial stage of manufacture for washing and conveying the beets, and possesses a temperature of about 35° C. The condenser is connected with the exhaust pipe of the air pump, while the force pipe of the latter machine puffs out, into the open, air which the pump has withdrawn.

There are two kinds of condensers, the wet and the dry, which differ from each other by their construction and their application. The air pump which operates with the wet condenser is also called the wet-air pump, while the dry condenser is in its turn connected with the dry-air pump. The wet condenser is situated close to the air pump, at the upper end of the factory, and sucks in the interjection water it requires from a maximum depth of 6 metres. In this case, however, the air pump is employed for getting rid of the injection and condensed water and of the noncondensed gases. As it is the part of the air pump to dispose of all the water, the wet condenser can be employed in cases where this water can find no further vent. If, however, the water does not find a vent, the dry condenser must be employed. In this case the condenser is placed in an elevated position. Water is injected into it which condenses the vapor from the juice, while the noncondensible gases and air are drawn off by the dry-air pump, which takes up no water in this instance. The condensed and injected water leaves the condenser through a pipe which leads down into a waste-water tank, and may then be utilized, as already stated, for washing and conveying the beets. The dry condenser must be placed at least 10 metres above the waste-water tank.

The juice contained in the last vessel of the evaporating apparatus (in the case we have assumed, the fourth vessel) and concentrated to 50° Balling is called concentrated juice or sirup, and is raised, by means of a sirup pump (*K*), to reservoirs (*L*) placed high up, and there kept warm by means of steam. From these reservoirs the sirup flows into the sirup presses (*M*), which are of a similar construction to the lye presses already described, or, in place of presses, the sirup may be run through filter bags and filtered. After the filtration the concentrated

sirup flows into a special reservoir, whence it is drawn off, either direct from the vacuum apparatus or from the first boiler. The sirup presses must be placed about three metres below the reservoir containing the unfiltered sirup.

For the purposes of explanation we will take the case in which the concentrated sirup passes into the first boiler, or fore vacuum as it is called, and then into the vacuum apparatus. The first boiler consists of a series of vessels of the same kind as those of the evaporating apparatus, and serves; by means of the use and economy of steam, to further concentrate the juice which actually passes into the vacuum boiler. It constitutes, therefore, a sort of fifth vessel, supplementing the quadruple effect of our evaporating apparatus. This first boiler, however, is not heated by the steam proceeding from the fourth vessel of the evaporating apparatus. It receives a portion of the vapor which passes from the third to the fourth vessel. As, however, an extra quantity of vapor is required for this purpose, more water must be added in the necessary proportion to the first three vessels of the quadruple evaporating apparatus, and the latter must possess correspondingly large evaporating surfaces.

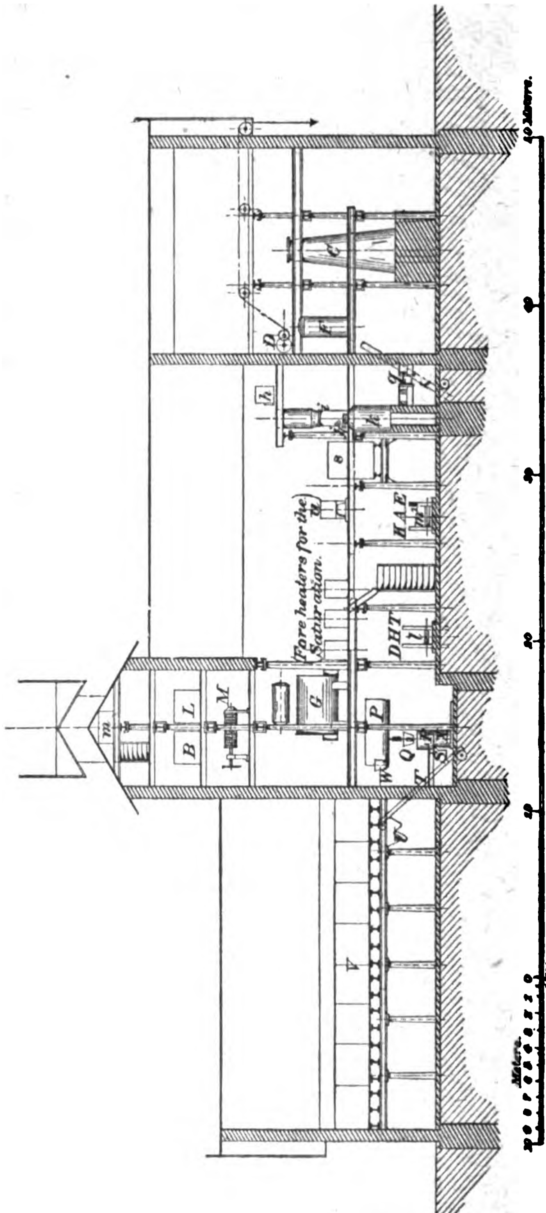
In this case each vessel of the quadruple apparatus will not have merely to evaporate about a quarter of the water in the diluted juice, but the first three vessels will have to evaporate a large proportion. From the reservoir the filtered concentrated sirup now passes into this "first boiler" at a concentration of 50 per cent. Balling. It receives the name "Concentrated sirup No. 1," and undergoes a further concentration to about 63 per cent. Balling by evaporation of water.

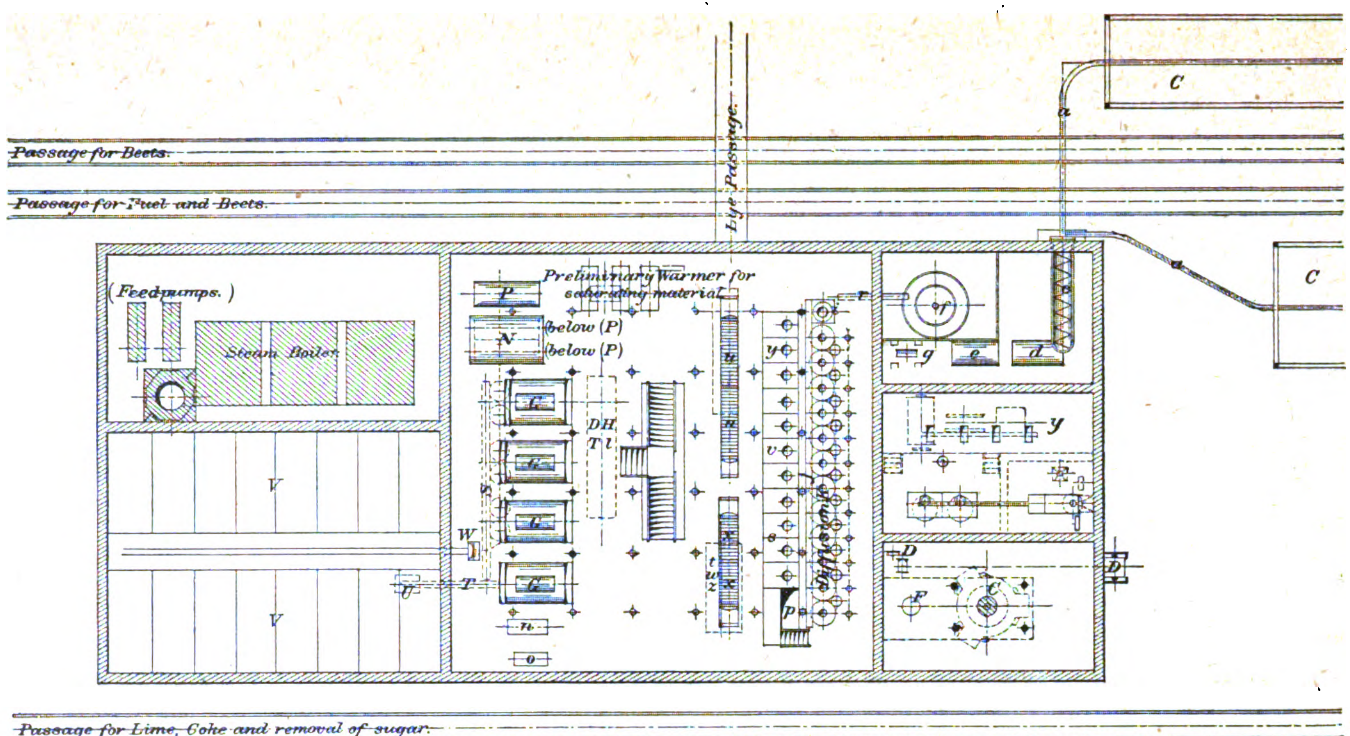
When the sirup has attained to this degree of concentration it is drawn off by means of pneumatic suction direct into the vacuum-boiler, or is transferred by means of a second concentrated sirup-pump to the reservoir set apart for "concentrated sirup No. 2," and is thence conveyed to the vacuum boiler. The vacuum boiler (N) consists of a vertical, cylindrical, or ball-shaped vessel, with a conical base, containing heating worm tubes. Latterly vacuum boilers have also been built of a box shape, with horizontal heating tubes (Wellner-Felinck system).

These boilers can be heated with steam obtained direct from a steam-boiler, with spent steam, or vapor from the evaporating apparatus in various combinations, according to the distribution of the entire evaporation. The object of boiling the juice is for the sugar to separate out in crystalline form. The product of the boiling may either be "clear" or in crystals. This depends on the purity of the concentrated juice. By "clear boiling" is understood the production of a thick sirup, which only deposits crystals when it has been removed from the vacuum boiler and allowed to cool. During the boiling process the sirup is perfectly clear. If the concentrated juice has been badly filtered, a quantity of nonsaccharine matter is retained in it. In this case clear boiling is the sole process possible, as a direct crystallization

PLAN OF A SUGAR FACTORY

Consuming 6,000 centners of beets in 24 hours. Built at Grevenbroich, Rhenish Prussia.





a Canal; *b* Beet-root house; *c* Spiral passage; *d* Bar washer; *e* Drum washer; *f* Caroussel; *g* Slanting chain pump *h* Weighing machine; *i* Slicing machine; *j* Filling transporter *k* Diffusion apparatus; *l* Water pump; *m* Reservoir; *m*1 Compression pump; *n* Fore-heater; *o* Second fore-heater; *p* Measuring cask; *q* Transporter; *r* Elevator; *s* First saturation; *t* Sand-catcher; *u* Filter-presses; *v* Second saturation; *w* Second sand-catcher; *x* Filter-presses; *y* Third saturation; *z* Third sand-catcher.

A Pump for diluted juice; *B* Reservoir; *C* Limekiln; *D* Elevator; *E* Carbonic acid gas pump; *F* Washing vessel; *G* Evaporating apparatus; *H* Pump for diluted juice; *I* Air-pump; *K* Sirup-pump; *L* Reservoir; *M* Sirup-presses; *N* Vacuum-boiler; *O* Air-pump; *P* Refrigerator; *Q* Movable basin and suspension line; *R* Transport-worm; *S* Transporter; *T* Elevator; *U* Sieve; *V* Reserve receptacles; *W* Mash machine; *X* Centrifugal machines; *Y* Steffen'sche separating process.

of the sugar can not then be effected. If, however, crystals are formed during the process of boiling (which can only take place after efficient filtering), direct crystallization is aimed at.

In the latter case the yield of crystals is much larger than with clear boiling, so that this method is universally adopted when the purity of the juice permits of it. The concentrated sirup No. 2, which has been conveyed into the vacuum boiler (in the example we have assumed), leaves the latter with a concentration of 95 per cent. Balling; that is to say, that the mass obtained from the vacuum boiler has been fixed by the evaporation which has taken place of all but 5 per cent. of its water.

The steam produced in the vacuum boiler by the evaporation of concentrated sirup No. 2 passes into receivers, which also contain the vapor given off from the evaporating apparatus, and the whole of this steam and vapor is then condensed to water in a condenser.

The vacuum boiler is connected with an air-pump (O) similar in construction to the first one employed in the evaporating process, and both of these operate on the common condenser above mentioned. A general air-pump of large size is also occasionally employed and serves both for the evaporating station and the vacuum boiler.

The mass obtained from the vacuum boiler contains, therefore, already 95 per cent. of sugar, which has now to be obtained.

It is open to employ either clear boiling or direct crystallization, according to the nature of this mass, which has also to be manipulated in one of two particular ways.

Before considering further the manipulation to which this mass requires to be subjected, it is as well to state beforehand that the mass can either be manufactured into raw sugar (with which it is the object of this treatise to deal) or direct into consumption goods. Raw sugar consists of sugar crystals hanging loosely together, of a color varying between yellow and brown, which have to be purified or refined before they can be employed for consumption. The sugar of consumption, on the other hand, consists of white sugar crystals in close conglomeration, and comes into commercial circulation in various forms.

Not always is it possible to manufacture the product of the vacuum boiler direct into consumption goods, in which a certain degree of purity has to be attained. Raw sugar, however, can be produced in any case.

It is with the manufacture of raw sugar that we have hitherto been concerned and to which we shall now limit ourselves.

For the production of raw sugar, then, the mass produced in the vacuum boiler can be equally well employed, whether clear boiled or crystallized out. In our description, however, we will only concern ourselves with the latter case, which is by far of the most general occurrence.

The mass obtained from the vacuum boiler is first of all placed in a re-

frigerator (P), which consists of a trough provided with a stirrer and a refrigerating jacket. This construction is of the latest and most approved kind. The mass, or rather the sugar crystals of which it consists, must now be separated from the sirup, so that raw sugar may be obtained, and this is effected in the following manner: The mass is transported in quantities at a time from the refrigerator into a movable jar (Q), or onto a horizontal transport-worm (R), and then conveyed to the centrifugal machines. A centrifugal machine consists of a cylindrical drum, over which is stretched a finely perforated sieve, and which rotates with great rapidity on its own axis. The mass placed in the drum is pressed against the sieve by the action of centrifugal force, and the fluid sirup escapes through the small apertures.

There are various kinds of centrifugal machines. In respect, however, of the safety afforded to the workmen engaged on the machine, apart from its intrinsic excellence, the Panzer, or armored centrifugal, is the best. For preventing accidents, which may be caused by overloading the drum, this part of the machine is so constructed that it may be emptied from the bottom, whereby its capabilities are also somewhat increased.

The sirup having been disposed of, the yellow sugar obtained is called the "first product," and this, having been emptied out of the drum, is placed upon a transporter (S) running horizontally, which conveys it to an elevator (T), by means of which it is transferred onto a sieve (U), where it is freed from lumps which it may contain. The raw sugar is then packed in sacks and sold for manufacture into consumption goods. As a rule, about 68 or 70 per cent. of raw sugar is obtained from the mass produced in the vacuum boiler.

A commencement is now made with the manipulation of the after-products, the sirup eliminated in the centrifugal machine, and which is known by the name of "green sirup" and constitutes from 30 to 32 per cent. of the mass produced in the vacuum boiler. In order to crystallize the sugar contained in this green matter, a further boiling is required. First of all, the green sirup, as it runs from the centrifugals, is pumped into certain reservoirs, and after passing through foreheaters, arrives in a vacuum boiler, or sirup-boiler, as it is sometimes called.

In this case, as with all subsequent decoctions of sirup, clear-boiling can alone be effected, the impurity of the sirup being so great that direct crystallization is impossible. The sirup-boiler closely resembles the vacuum boiler (in some cases is identical with it) and is provided with a system of warming-tubes. The steam produced by the boiling of the sirup passes over to the receiver already referred to, and subsequently into the condenser in company with the steam and vapor from the evaporating apparatus and vacuum boiler previously used, and is there condensed to water to be used as waste-water. The sirup-boiler is heated either with spent steam from the steam engine or with vapor

from the evaporating vessels. The sirup contained in it, and which shows 73 per cent. of sugar by the saccharometer, is condensed to about 90 per cent. This apparatus has also to be connected with an air-pump, which operates, together with the other air-pumps previously mentioned, on the common condenser.

The best arrangement, however, is to provide the evaporating station with a special air-pump, and the sirup-boiler and vacuum boiler with one in common. The green sirup is boiled from day to day, and the mass obtained from it by evaporation, and which shows 90 per cent. of sugar by the saccharometer, is called the "second product." This clear-boiled mass is then transferred from the sirup-boiler into receptacles, called reserve receptacles (*v*), and placed in a warm room. Here it remains for about ten days in order to crystallize out. When the crystallization is complete the product is raised in an elevator and placed in tip-trucks, which convey it to a mash machine (W), which is provided with a smasher. The object of the mash machine and the smasher is to pound the larger crystals small. The second product is then conveyed by means of a suspension line (Q), or a transport-worm to the centrifugal machines (X) specially constructed for it.

These centrifugals are built on the same plan as those used in the manufacture of the first product, but their drum diameter is, as a rule, somewhat smaller. The mass placed in these centrifugals is treated in exactly the same way as in the former case; the raw sugar remains behind in the drum and the fluid which runs out is pumped up into the afterproduct chamber. The raw sugar thus obtained is called raw sugar of the second product, and is only distinguished from raw sugar of the first product by a less robust grain. About 25 per cent. of sugar is contained in the green sirup, which is called sirup of the second product. Having left the centrifugals, this sugar goes through exactly the same process as its predecessor, the sugar of the first product. The mass separated out from this sugar in the centrifugals contains about 75 per cent. of nonsaccharine matter. It is drawn up by means of a pump into the reserve receptacles (*v*), and afterwards decocted once more. The separated sirup is transferred from the reserves into the sirup-boiler (exactly as before), and there concentrated from 73 to 90 per cent., the resulting mass being called "third product." This mass is brought into reserve (*v*) in the afterproduct chamber, where it remains for about thirty days, in order to crystallize out. After this crystallization it goes through exactly the same process as in the previous case, raw sugar being finally obtained, which is called raw sugar of the third product. Of this raw sugar, the third-product mass contains about 16 to 18 per cent. This raw sugar is brought into the market in the same way as its two predecessors.

The sirup separated out by the centrifugals (about 82 to 84 per cent. of the entire mass) is also in this case pumped into reserve receptacles in the afterproduct chamber and afterwards sold as molasses (if this

has not already taken place with the sirup of the second product), or it is decocted a fourth time (in the same way as in the previous cases) and the sirup finally remaining over from this last operations old as molasses.

The mass of the fourth product produced from this sirup in the sirup-boiler must remain in the afterproduct chamber for some months, as a rule, until the next *campagne*, at a temperature of 50° C., to render the separation of the sugar of the fourth product a feasible task.

As we have mentioned molasses, we may as well consider this product a little more closely for a moment. Molasses is the last sirup formed in the manufacture of sugar, and on account of its high percentage of nonsaccharine matter can form few or no sugar crystals even after lengthy stocking. It is therefore sold to spirit-distillers or, if the local conditions are favorable, once more manipulated for the extraction of the little sugar which it contains. By employing a sugar-eliminating process (the Steffen separating process is the simplest and best), almost all the sugar contained in the molasses may be obtained. We must refrain from describing this process, for the American patent of the same has been secured for the United States by Mr. Claus Spreckels, of San Francisco, and the process, therefore, can only be employed by that gentleman.

In conclusion we may remark that all the individual machines employed in the sugar branch are constructed in as many different ways as there are machine-factories to make them. Of course these variations are only of an unimportant character, but at the same time we must take this opportunity of recommending specially one firm which concerns itself solely with the construction of all kinds of machinery and apparatus for employment in all branches of sugar-manufacture, whether from beets or cane. The name of this firm is the Maschinenfabrik Langen und Hundhausen, in Grevenbroich (Rhenish Prussia). Its manufactures have always found fullest approval in the sugar-factories where they have been employed. Most of those practical and simply constructed separating apparatus on the Steffen system employed in the manufacture of raw sugar are obtained from this firm.

JOSEPH FALKENBACH,
Consul.

UNITED STATES CONSULATE,
Barmen, November 24, 1888.

Estimated cost of a beet-sugar factory consuming daily (24 hours) 300,000 kilograms of beets, by Messrs. Langen & Hundhausen, in Grevenbroich, Rhenish Prussia.

Number.	Machinery.	Estimated weight.	Estimated cost.
	Beet-house.	*Kilograms.*	*Marks.*
1	One spiral beet-conveyer, 1,000 centimetres diameter and 8,000 centimetres long, with wheel work, propelling power, and grappling-irons, complete	8,000	....
2	One beet-washing machine, 1,400 diameter, 3,000 centimetres long, stone-catching apparatus, propelling power, and bedding, complete	6,000	....
3	The iron pieces for a beet-elevator, 12 meters long, with iron trestle-work, tried chains, and funnels, complete	25,000	13,900
	Diffusion and boiling-house.		
4	One beet-cutting machine, with receiving and throwing-out hoppers, gearing, steel spindle, mounted knife-disk (without blades), 3 lifting cars to be inserted on top, complete	....	....
5	Twenty-four lifting bars, mounted with receiver, exclusive of blades (reserve)	....	....
6	The diffusion battery, consisting of 12 wrought-iron vessels, 1,400 centimeters, 2,100 holes in straight plates, with connecting wrought-iron adjustage, upper and lower manhole cover, bucket-charger, and sieve bottom, complete	....	....
7	Twelve single calorisators of 4 square metres heating surface in drawn brass pipes, inclusive of stop-valve, 25 centimeters diameter, escape-valve, 20 centimetres diameter, with thermometer, complete	....	....
8	Thirty-six diffusion-valves of 125 centimeters diameter, with rising spindle	....	....
9	Twelve tapping-valves, 100 diameter, with wrought-iron lengthening spindles, cast-iron column, with lever	....	....
10	Twelve valves, 50 diameter, for air transmission	....	....
11	Twelve air-discharging cocks, with curves, 25 diameter	....	....
12	Complete pipe system of diffusion battery for juice, water, steam, and air; the diameters worked and bored corresponding to the valves at Nos. 8, 9, 10, and 11	....	....
13	Impermeable rubber and screwing apparatus for the pipe system, valves, and man-hole covers of the diffusion battery	....	....
14	Three hose cocks, 30 diameter, for water	....	....
15	The worked I iron supporters for the diffusion battery	....	....
16	One complete chip-filling transporter with wooden gearing, without girders	....	....
17	The iron pieces for a horizontal chip transporter below the diffusion apparatus, without girders	....	....
18	One horizontal working-machine, 400 diameter, 700 strokes, with Dr. Proll's regulator, Mayer's expansion, with grappling-irons, complete	....	....
19	One horizontal steam-pump for carbonic acid, with two air compressors attached, to serve the diffusion and sulphur furnaces; steam-cylinder, 400 diameter; carbonic acid cylinder, 700 diameter; air compressor for diffusion, 200 diameter; sulphur furnaces, 120 diameter; piston for joint use, 700 millimetres	....	....
20	Eleven saturation vessels for first, second, and third saturation, of 2,600, 2,200, and 1,200 (broad), inclusive of lime-measuring vessels, armature, and transmission	....	....
21	Three stone catchers between saturation and lye-pump	....	....
22	One horizontal triplicate lye-pump for the three saturations; steam-cylinder, 425 diameter; plunger, 200 diameter; joint piston, 400 millimeters	....	....
23	Seven filter presses, with thirty chambers each, for the first and second saturations, and two filter presses, with twenty-four chambers each, for the third saturation	....	....
24	Two sulphur furnaces, with charging pans, compression stop-valves, and air transmission, complete	....	....
25	One triple-effect evaporation apparatus, Wellner-Felinck system; I body, 200 square metres; II body, 200 square metres; III body, 200 square metres; total, 600 square metres heating surface; complete, including armature, evaporating liquor conduit of pipes, and three reservoirs for the condensed steam, with armature	....	....
26	Horizontal steam-pump machines, consisting of cold-water pump, with sideways attached; pumps for condensed steam, thin juice, sirup and edulcoration; water pump, with air-pump behind; steam-cylinder, 550 centimetres diameter; cold-water pump, 350 diameter, double acting; condensed steam-pump, 175 diameter, double acting; thin-juice pump, 175 diameter, double acting; sirup-pump, 175 diameter, double acting; edulcoration water-pump, 150 diameter, double acting; air-pump, 850 diameter, double acting; engine for joint use, 700 millimetres, complete, with grappling-irons	....	....
27	One feed heater for condensed steam from evaporated juice, 150 square metres heating surface, in drawn brass pipes, counter construction, complete, with armature (vertical); one feed heater for direct steam of the same construction, 45 square metres heating surface, complete	....	....
28	One vacuum, Wellner-Felinck system, holding 15,000 kilograms feeding fluid, of 70 square metres heating surface, constructed for direct and reverse steam, complete, with armature	....	....

Estimated cost of a beet-sugar factory, etc.—Continued.

Number.	Machinery.	Estimated weight.	Estimated cost.
	Diffusion and boiling-house—Continued.	*Kilograms.*	*Marks.*
29	One sirup vacuum, with vertical pipes of 60 square metres heating surface, complete, with armature, for direct and reverse steam	....	....
30	Two horizontal cooling mash-basins, with elliptical stirring apparatus, to hold 10,000 kilograms of fluid, with water-cooler, gearing, etc., complete	....	....
31	One wrought-iron cataract condenser, with recondensation, 13,000 diameter, 2,200 centimetres high. Total of Nos. 4 to 31, inclusive	....	188, 278
	Sugar-house.		
32	Six armor-plated centrifugal machines, with tambour, 960 diameter, 470 millimetres high, with wrought-iron jacket reaching to the ground, complete	....	....
33	One feeding carriage, with sliding stop-valve, and suspension track above the centrifugal	....	....
34	One plunger pump, for transmission, of 100 diameter, 150 strokes	....	....
35	One horizontal machine, 350 diameter, 700 strokes, with Dr. Pröll's regulator and Mayer's expansion, complete, with grappling-irons	....	....
36	One horizontal mash for by products, with a crushing machine, 500 diameter, 1,200 centimetres long	....	....
37	Ten crystallization vessels of sheet-iron, with sliding stop, of 10 square metres volume each for first produce; twenty-five crystallization vessels, of 18 square metres volume each, for second produce	....	....
38	The iron pieces for two complete cable elevators, with English chains, etc. Total of 32 to 38, inclusive	....	40, 650
	Lime station.		
39	The iron pieces for a limekiln, with three coke furnaces, complete, with wrought-iron casing	....	....
40	The iron pieces for a limestone elevator, with stool, English chains, etc., without wooden gearing	....	....
41	One wrought-iron laver for cooling and washing the carbonic acid, with sieve, bottom, man-hole cover, etc., complete	....	....
42	Three wrought-iron, lime-slacking vessels, with stone catcher, delivery valve, etc	....	....
43	One wrought-iron lime-milk settling vessel, No. 3	....	....
44	Lime-milk stirring apparatus in wrought-iron box, with bedding, gearing, etc	....	....
45	One plunger-pump to carry the lime-milk to the saturation, 120 diameter, 180 strokes. Total of 39 to 45, inclusive	....	7, 360
	Boiler house.		
46	Seven steam-boilers of 90 square metres heating surface, with the necessary armature, according to the legal requirements of the German Government	....	....
47	One horizontal steam feed-pump, with governors; steam-cylinder, 300 diameter; pump cylinder, 200 diameter; strokes, 400 millimetres; complete, with grappling-irons; one hand-feed pump, 80 diameter, 200 strokes	....	....
48	One feed-water reservoir of wrought iron, 1,400 diameter, 3,000 centimetres long, with safety-valve, water mark, etc	....	....
49	Transmission for the whole factory works. Total of 46 to 49, inclusive	....	72, 275
	Grand total (at 23.8, $76, 746)	....	322, 463

AUSTRIA-HUNGARY.

AUSTRIA-HUNGARY, 1867.

REPORT BY CONSUL-GENERAL POST, OF VIENNA.

The production and the export of beet-root sugar is increasing, and the history of its increase is best shown by the following table:

Table showing the quantity of beets taxed and used during the last three years in Austria.

Season of—	No. of factories in operation.	Quantity of beets taxed.	Amount of tax collected.	Average quantity of beets used by one factory in the three years.	Average amount of taxes paid by one factory during the three years.*
		Vienna cwt.	*Florins.*	*Vienna cwt.*	*Fl. kr.*
1864–'65	143	18, 040, 561	7, 387, 609	125. 916	51, 562 60
1865–'66	138	15, 612, 209	6, 393, 199		
1866–'67	138	19, 105, 874	7, 823, 855		

* The tax on beets is at the rate of 40.95 kreutzers per Vienna centuer. A Vienna hundred-weight is equal to 123.4616 pounds.

Table showing Austria's sugar production, consumption, export and import, during the las thirty-three years, from 1834–'35 to 1867.

For the season of—	Average quantity of beets taxed per year.*	Amount of raw sugar produced per year.*	Average import of colonial sugar per year.*	Sugar exported per year.*	Colonial sugar imported and beet-root sugar productions, less the exportation per year.*	Population.	Amount of sugar consumed per person.†	Average price of loaf sugar.	No. of factories in operation.
1834–1839	605, 616	30, 270	518, 193	38	548, 425	36, 000, 000	1. 52	44. 25	37. 2
1830–1844	1, 577, 995	78, 875	574, 470	80	504, 316	35, 444, 400	1. 42	38. 00	42. 6
1844–1849	1, 729, 280	103, 757	568. 955	150	672, 562	37, 160, 400	1. 81	38. 00	59. 4
1849–1854	5, 196, 896	311, 814	787, 478	324	1, 098, 968	36, 451, 600	3. 01	39. 20	97. 6
1854–1859	11, 712, 692	820, 080	581, 489	88	1, 401, 481	36, 714, 600	3. 00	41. 90	119. 2
1859–1864	17, 798, 429	1, 246, 090	71, 125	21, 058	1, 296, 157	36, 917, 200	3. 51	39. 50	135. 2
1864–1867	19, 201, 861	1, 344, 136	2, 115	506, 074	840, 177	35, 650, 000	2. 36	36. 32	139. 4

* Custom cwt. † Custom pound.

P. SIDNEY POST,
Consul.

UNITED STATES CONSULATE-GENERAL,
Vienna, December 31, 1867.

AUSTRIA-HUNGARY—1870.

REPORT BY CONSUL-GENERAL POST, OF VIENNA.

The production of beet-root sugar in the Austro-Hungarian monarchy has been as follows:

	Vienna centners.	Florins.
1868	20,030,937	8,202,668
1869	21,982,209	9,001,713
Increase	1,951,272	799,045

Shortly after the opening of the sugar campaign in 1868 and 1869, alarming reports were spread abroad concerning the quantity of beets, indicating that there were insufficient supplies even for home consumption. Unfortunately no official and trustworthy contradiction was made of these reports, though, in consequence of the tax levied upon the beets, it would have been easy to have given such official denial. In the month of January a combination was formed, and the price advanced more than 10 per cent., but it soon became evident that the old beet crop had been underestimated, and the old prices were again restored.

ROBERTS'S NEW INVENTION.

A former report, published in the Commercial Relations of the year 1867, page 513, contained a description of Roberts's diffusion process for extracting sugar from cane or beets. That invention required what was called a "battery of diffusion," consisting of a number of vessels which were filled with a certain quantity of the sliced cane or beets, and through which water, heated to a certain temperature, was forced in a certain succession and systematic order requisite for the complete extraction and proper concentration of the diffusion juice.

Mr. Roberts has now perfected this invention, or rather made a new invention, and this diffusion process may now be carried on in a single vessel through the instrumentality of a feeding apparatus, by means of which the slices of cane, beet root, or other plant from which the sugar is to be extracted are introduced at the bottom of the vessel, and in which they slowly and gradually rise to the top, while fresh water is constantly running in at the top of the diffusion vessel, and after having remained in contact with the slices for a sufficient length of time, and having extracted the sugar therefrom, it is drawn off as diffusion juice at the bottom. The water in its gradual descent through the entire length of the diffusion vessel passes through all the stages of gradual increasing concentration which are obtained in the diffusion vessels of a diffusion battery, and the slices in their ascent become gradually extracted in a corresponding manner, so that the whole process of extraction is effectively carried out in one single vessel. Mr. Roberts has tried his invention at his sugar factory on a large scale, and has found it to work to his entire satisfaction.

P. S. POST,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Vienna, September 30, 1870.

AUSTRIA—1873.

REPORT BY CONSUL-GENERAL POST, OF VIENNA.

The remarkable invention of Julius Roberts for extracting sugar, described in former reports published in the Commercial Relations, 1867 and 1870, has proved itself to be a most useful and important one. The diffusion process is applicable to extracting sugar from cane as well as from beets, and a large amount of machinery is now on the way from this Empire to Louisiana, for the introduction of the process in our sugar-producing districts. The favorable reception this diffusion process has received in the beet-root manufacturing countries is best indicated by the following table, which shows its rapid and general introduction:

Table showing the number of manufactories which have adopted the Roberts diffusion process.

Year.	Austria.	Germany.	Russia and Poland.	Holland.	Sweden.	Denmark.	East Indies.	New.	Remodeled.	Total.
1865	1	......	1	......	......	......	......	1	1	2
1866	3	5	......	......	......	......	1	3	6	9
1867	10	2	8	......	......	......	......	9	6	15
1868	13	2	3	1	......	......	......	11	8	19
1869	14	15	4	1	2	......	......	24	12	36
1870	27	23	6	....	1	......	......	45	12	57
1871	37	11	6	......	......	......	......	39	15	54
1872	24	6	9	....	1	1	......	18	23	41
1873	......	......	10	......	......	......	......	8	2	10
	129	64	42	2	4	1	1	158	85	243

P. S. POST,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Vienna, September 30, 1873.

AUSTRIA-HUNGARY—1885.

REPORT OF VICE-CONSUL HÜNING, OF PRAGUE.

A direct shipment of beet-root sugar was made a few weeks ago from this consular district to the United States, the first one of this kind. As this industry is of the greatest interest to America, I applied to the chamber of commerce, to the board of trade, and to other official sources for information on this subject, the result of which I submit herewith.

There are few countries in Europe of the same extent and population for which the beet-root sugar industry has equal importance and significance as Bohemia, not alone on account of the prominent position which this branch of industry occupies, but also on account of its bearing on the rational cultivation of agricultural lands; the breeding of

cattle, the adoption of machinery, and the opening of new communications. Statistics show that the prosperity and decline of the Bohemian sugar industry affects to a greater or less extent the banking institutes, the coal-mining interest, and the spirit manufactories. The Bohemian sugar industry is greater than that of all the other provinces of the Empire, Hungary included, taken together.

Official statistics show that during the campaign of 1883–'84 the entire number of sugar factories in Austria-Hungary was 230, of which 152 were located in Bohemia; and that of the entire quantity of 41,845,679 metrical centners of beets on which a tax was levied before they were manufactured into sugar, 26,178,845 metrical centners fell to the share of Bohemia alone.

The following table shows the quantity of beets converted into sugar, the Government tax levied, and the number of factories in Bohemia during the last ten years:

Year.	Number of factories.	Quantity of beets.	Amount of tax.	Average amount of each factory.	
				Quantity.	Tax.
		Met. cent.	*Florins.*	*Met. cent.*	*Florins.*
1874–'75	145	5,344,100	3,907,434	36,856	26,948
1875–'76	150	8,581,660	6,263,352	57,211	41,756
1876–'77	149	9,725,560	7,099,654	65,272	47,649
1877–'78	152	15,297,910	11,167,474	100,644	73,470
1878–'79	151	17,619,500	12,862,230	116,685	85,180
1879–'80	150	18,266,150	13,334,227	121,774	88,895
1880–'81	152	28,081,510	22,465,210	184,747	147,797
1881–'82	155	28,327,110	22,661,685	182,756	146,234
1882–'83	154	31,968,280	25,574,626	207,586	166,069
1883–'84	152	26,178,845	20,943,076	172,229	137,783
Average	151	18,939,062	14,627,897	125,424	96,873

Exports of sugar from Bohemia on which the Government bounty was paid.

[In metrical centners.]

Year.	Refined.	Powdered.	Total.
1875	38,695	446,981	485,676
1876	114,387	763,365	877,752
1877	99,979	850,660	950,648
1878	120,892	745,154	866,046
1879	136,448	1,219,751	1,356,199
1880	167,775	1,481,559	1,649,334
1881	269,897	1,589,370	1,859,268
1882	316,096	1,101,564	1,417,659
1883	464,930	1,257,373	1,722,303
1884	467,564	1,552,534	2,020,098
Average	219,666	1,100,832	1,320,498

The bounty paid by Government in 1884 for sugar exported from the countries represented in the Reichsrath amounted to 23,313,468 florins, for sugar exported from Hungary to 1,011,877 florins, and from Bohemia alone to 19,977,076 florins, of which sum 5,400,372 florins was for refined and 14,576,734 florins for powdered sugar, while in 1883 the

amount paid for bounties for exports from Bohemia was 17,184,482 florins.

During the campaign 1884-'85 there were in operation in the entire Austrian Empire 249 sugar factories, of which number 165 were situated in Bohemia. Of these latter 50 were owned by joint stock companies, 3 by large corporations, 2 by the Bohemian Sugar Industrial Society, 60 by the nobility, 3 by the Emperor, and the rest by private parties.

Machinery employed by the sugar factories of Bohemia and of Austria-Hungary during the campaign 1883 *to* 1884.

Items.	Bohemia.	Entire Empire.
Total number of factories	152	230
Total number of steam-boilers	1,223	1,912
Heating surface in square metres	91,348	157,273
Motive power:		
Steam horse-power	16,334	25,809
Water	26	31

Quantity of beets converted into sugar, and the expenses of manufacture and fuel, during the campaign 1883 *to* 1884.

Items.	Bohemia.		Entire Empire.	
	Quantity.	Average price per metrical centner.	Quantity.	Average price per metrical centner.
	Met. cent.	*Kreuzers.*	*Met. cent.*	*Kreuzers.*
Fresh beets used	26,178,169	100-200	41,845,679	95-200
Manufactured sugar	619,964	....	765,844	....
Molasses	1,336,840	....	1,383,880	....
Fuel:				
Coal	12,195,702	80-190	17,881,151	28-130
Charcoal	295	190-400	295	190-400
Cokes	87,414	120-175	118,444	102-175
Wood	155	360-500	18,125	200-500
Spodumene	229,609	72-20	365,897	11-20

During the campaign of 1883-'84 the number of persons employed in the sugar manufactories of Bohemia was 30,580 males and 11,332 females, and in those of the entire Empire of Austria-Hungary 46,683 males and 20,024 females, whose daily wages average from 35 kreuzers to 1 florin; 80 kreuzers per day for males, and from 20 kreuzers to 1 florin 20 kreuzers for females.

The Government tax on beets for the same period of time amounted to 20,942,535 florins for Bohemia and to 33,476,543 florins for the entire Empire.

The extraction of the juice in the 152 factories of Bohemia took place by means of what is known as the diffusion process, while the old method of employing grinding and powerful presses was adopted by twelve factories situated in other parts of the Empire.

When sugar first became an article of export the Government paid a certain bounty or drawback, which in 1860 was 5.16 florins on the centner of refined and 4.20 florins on powdered sugar. In 1864 the bounty was increased to 6.51 florins on refined and 5.30 florins on powdered

sugar, and the bounty paid at present is 8.40 florins on the metrical centner of sugar containing from 88 to 92 per cent. of saccharine matter; 9.40 florins on the metrical centner of sugar containing from 92 to 99½ per cent. of saccharine matter, and 11.55 florins on the metrical centner containing more than 99½ per cent.

The financial calamities caused by the crisis in the sugar trade in the fall of 1884, the unforeseen collapse of the Bohemian "Boden-Credit-Anstalt," which caused the closing of a number of sugar factories depending entirely upon that institution for support, and the consequent lack of faith on the part of the Bohemian and Moravian growers, rendered a further existence of this branch of industry for some time extremely doubtful. A long time was required before matters became more settled and confidence restored, and even now it has not yet entirely recovered. It is now admitted on all sides that the crisis was caused by an excessive cultivation of beets and an irrational over-production of sugar in Bohemia and other sugar-producing countries of Europe, and that the gradual improvement is due solely to the movement in favor of a reduced cultivation of the sugar beet.

The prospect, however, that the Bohemian sugar industry will fully recover from the disastrous blow it had been made to feel, is made problematical by the fact that this branch of its industry is confined almost to export alone, and that foreign legislation, repeated increases in the rates of tariffs and customs, as well as obstacles in the means of communication and transportation, all tend towards driving the Bohemian sugar from foreign markets without opening new fields, and home consumption being as yet far too little developed in proportion to the number of population to make it remunerative, the more so as the frugality of the people is proverbial and not likely to undergo a sudden change.

The consumption of sugar in Austria is calculated to average 6 kilograms for every inhabitant per year, but in Bohemia, where coffee is in great demand, it is a fraction over 6 kilograms.

From the following statement, compiled from official statistics furnished me for this purpose, may be learned the actual present condition of the beet-root sugar industry of Bohemia and of Austria-Hungary during the campaign of 1885–'86:

Items.	Bohemia	Entire enterprises.
Factories in operation	139	214
Factories closed*	11	14
Refineries in operation	11	15
Refineries closed	2	3
Extraction of juice by diffusion	139	203
Extraction of juice by pressure	....	11
Exclusively powdered sugar	107	144
Refined and powdered	18	35
Exclusively refined sugar	22	44
Exclusively pilé	3	6
Molasses	150	229

* There are six factories aside from these where resumption of business is doubtful, but likely the will remain closed.

Table showing the average price of the metrical centner of sugar in Austrian currency (florins) and the London rate of exchange, during the ten years from 1876 to 1885.

Description, etc.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
Powdered sugar, basis 88 per cent., at Bohemian railroad station	28.05	45.12	31.43	29.90	36.00	33.92	33.60	30.65	28.77	19.42
1*a*. Centrifugal pilé, free transit, Trieste	30.25	44.50	32.00	30.00	33.37	31.00	32.00	29.25	27.25	17.25
Fine brod molasses, from Vienna railroad station	43.00	61.50	44.50	42.50	47.12	42.50	46.00	43.12	41.00	30.87
London rate of exchange	113.06	125.53	120.12	117.20	116.92	117.74	118.93	119.44	121.06	123.40

TOTAL AVERAGE DURING THE TEN YEARS.

Powdered sugar, basis 88 per cent., at Bohemian railway station	31.64
1*a*. Centrifugal pilé, free transit, Trieste	30.68
Fine brod molasses, from Vienna railway station	44.29
London rate of exchange	119.31

The greater part of the sugar exported from Bohemia is sent by way of the river Elbe to Hamburg, and from there to England.

Other markets are Holland and France, though legislation in these two last-mentioned countries has seriously injured the trade of late; the export to Italy has also suffered in consequence of the higher rates of duty imposed, the gradual development of domestic production, and the competition made by Russia. The chief markets for Bohemian sugar are the Balkan States, Servia, Roumania, Bulgaria, and Greece, Turkey, and the Levant, where it not only occupies the first position, but has even succeeded in driving its rivals and competitors, England and France, almost entirely from these markets, and it is only quite recently that Russia begins to boom up as a competing power. Some shipments even found their way to Persia, to ports of the Red Sea, and to Ceylon, as well as to Tunis and Morocco. Several attempts have been made to gain a foothold in the markets of the West, and several shipments were made to Spain, to the La Plata States, and other South American countries, and one to the United States, but there is not the slightest doubt that a great deal of the "German sugar" shipped from Hamburg to the United States is Bohemian product; and as soon as the investigations I am now making to find out this proportion have placed me in possession of the necessary information, I shall immediately place it at your disposition.

WILLIAM HÜNING,
Vice-Consul.

UNITED STATES CONSULATE,
Prague, Bohemia, February 6, 1886.

AUSTRIA-HUNGARY--1889.

THE SUGAR-BEET INDUSTRY OF BOHEMIA.

REPORT BY COMMERCIAL AGENT HAWES, OF REICHENBERG.

INTRODUCTORY.

During the year ended June 30, 1888, the United States imported sugar, including molasses and confectionery, amounting to $79,760,891. So little sugar is grown in the United States, indeed, that it has been proposed to remove the duty on this article upon the ground that we have no sugar industry to protect.

The Department of Agriculture has for years, with the aid of Congress, been endeavoring to establish a substitute for sugar cane by the cultivation of sorghum. While the latter experiments seem to show that sorghum can be successfully cultivated and manufactured into sugar in the United States, I desire to call attention to a subject that has passed beyond the stage of experimentation in Europe, and which, indeed, meets the indorsement of so practical and successful a manufacturer as the well-known Claus Spreckels. According to this authority, sugar-beet culture can be successful and profitable just as much on the Atlantic slope as on the Pacific, in the Mississippi Valley as in California.

Why should we pay out $80,000,000 yearly for an article that we can easily produce ourselves?

Clearly our efforts should be directed to the development and protection of such an industry until we may be able to save the enormous sum now paid to foreign countries, if not eventually to supply those countries themselves with sugar.

It has been my aim to make the following report so complete that the practical farmer, as well as the theorist, may become interested in the subject and find all the details necessary for his information. I have also described briefly the process of manufacture.

With this preface I will pass directly to my subject, and first call attention to the

CULTIVATION OF THE SUGAR BEET.

The sugar beet (*Beta vulgaris saccharifera*) is a variety of the class *Beta vulgaris linnæi*, and belongs to the family *Chenopodiaceæ*. It has become biennial by cultivation, and there are many varieties.

The conditions required of a good sugar beet are—

(1) Regular shape (cone, pear, or olive shape). Many side roots or prongs are disadvantageous, because they make cleaning more difficult and increase the waste. The leaves should be thick and should be of the characteristic shape and color, and those which lie flat are to be preferred as protecting the beet against frost.

(2) A medium size, say, 1 to 2 pounds. Small beets make a small

crop, while large beets contain comparatively little sugar. The length should not be more than 35 centimeters. The crop should not be less than 30,000 kilograms to the hectare ($2\frac{1}{5}$ acres).

(3) Rich in sugar—from 9 to 16 per cent.

(4) A white, compact, brittle substance. Such beets are more resistant to destruction by storage. A small head not protruding from the ground, as this head must be cut off, containing, as it does, very little sugar.

It is very important to select the proper variety for a given district, because the different economical conditions of climate and soil require different varieties, if the largest possible crop is to be harvested. It is, therefore, quite necessary for every farmer to experiment with different varieties.

VARIETIES OF BEET.

The varieties which fulfill the above conditions are—

(1) *The white beet of Silesia.*—This beet was formerly the best sugar-beet; to-day it is only used where large quantities are required, as it does not contain as much sugar as some other varieties. This beet requires an excellent soil.

(2) *The Quedlinburger.*—This beet is distinguished as ripening 14 days earlier than most other beets, so that in localities where an early frost is the rule this beet is to be preferred.

(3) *The Imperial.*—This beet is excellent for deep, good soils. It has now three offspring:

(*a*) The white Imperial, by Knauer.

(*b*) The small Wanzlebner, which has a high percentage of sugar.

(*c*) Brothers Dippe small Wanzlebner.

(4) *Knauer Electoral.*—This is good on soils otherwise unfit for beet cultivation, as hilly lands and poor alluvial soils.

(5) *Knauer Mangold.*—This beet at present contains the highest percentage of sugar.

(6) *Vilmorin.*—This beet is very valuable, as it produces a sufficient percentage of sugar on low lands rich in nitrogen, and in soils where all other kinds are valueless.

The offspring of this variety are—

(*a*) Vilmorin blanche ameliorée.

(*b*) Vilmorin rose partial.

(*c*) Vilmorin blanche collet rose.

(*d*) Vilmorin collet verte race braberut.

(*e*) Brothers Dippe white élite—very rich in sugar.

(*f*) Besteborn's Imperator, which is not recommended, as it has the faults of the Vilmorin, *i. e.*, too many side rootlets and not sufficient sugar.

CLIMATE.

In Europe the sugar beet is successfully planted between the forty-seventh and fifty-fourth degrees of northern latitude; in Germany, between the fifty-first and fifty-fourth; in France, between the forty-seventh and fiftieth; in Austria-Hungary, between the forty-eighth and fiftieth; and in Russia, between the forty-eighth and fifty-third degrees.

Like all plants, the sugar beet requires certain conditions of climate to arrive at perfection.

According to the experiments of Briem, director of the experimental station in Grusbach, Moravia, concerning the distribution of warmth and rainfall during the period of vegetation of the sugar beet in the first period, *i. e.*, in the first two months, the time of germinating, the daily temperature was 10.70° C.; in the second period (the time of development of the vegetative organs), 18.8° C.; and in the third period (in which the storage of the reserve substances takes place), 16.5° C.; and during the whole vegetation, 15.3° C.

The total warmth in the first period was 650° C.; in the second, 1,150° C.; and in the third, 1,000° C.

The rainfall was in the first period 97 millimetres; in the second, 114 millimetres; and, in the third, 100 millimetres; together, 311 millimetres. The sugar beet needs much warmth and light, sunny days, and a certain amount of moisture.

The best climate for sugar beets is the so-called "wine climate," with a temperature from 9° to 10° C. in April and May, 17° to 18° C. in June and July, and 15° and 12° in August and September, respectively.

The seacoast is not warm enough and has not enough sunny days in June and July to be successful for sugar-beet raising.

For the first period of vegetation it is necessary that a certain amount of winter moisture be in the ground, as the seeds need moisture to germinate. In the second period warmth and moisture are required for the production of roots and leaves. In the third period, in which the saccharification goes on, dry warmth. If the days be sunny, the beets will become rich in sugar; but if this period be wet the crop will be great in quantity, but poor in quality. If, after a dry summer, a warm and rainy fall follows, new leaves spring up at the cost of the sugar.

SOIL.

The best soils for quality as well as quantity of production, according to the experiments of Orth, are those that consist of mild, moist loam about 50 centimetres deep, then loam or marl 1 to 2 metres, and, under this, sand. Such soils, which are easy to cultivate, have a high degree of absorption, can combine nourishments, and give the plant physically a good start. Such soils are called "natural sugar-beet soils."

It is possible to raise beets on soils that do not have all these qualities, but the crop will be better the nearer this standard is approached.

The conditions required for a good sugar-beet soil are—

(1) Depth, because the roots mostly take their nourishment from a depth of 30 centimetres, and the soil must therefore be loosened and contain nourishment up to this depth.

(2) Porousness of the subsoil, because it is impossible to cultivate a damp, cold soil at the right time. Such a soil will become cracked if very dry, and the young plants suffer, while the beets will contain little sugar. In such a case drainage must be employed. Clay soils can be improved by manuring, by the use of lime, and drainage; light soils, by manuring and loamy marl.

Leplay found that the heaviest beets will be raised in descendant succession from clay, lime, loam, and sand soils; beets with the greatest percentage of sugar, in lime, clay, sand, and loam soils; the most leaves, in sand, clay, lime, and loam soils. According to experiments of Marek, the more moisture in the soil the greater will be the development of leaves. This influence is stronger in sand soil than in one of clay. The normal development of the root depends upon organic matter in the soil. The more moisture there is in the soil the looser the texture, the poorer the quality, and the less sugar will be in the beet.

The following soils are adapted for the culture of the beet, if they have a good subsoil: Loamy soils, mild, clayey, or sandy, and clay marl. Of clay soils, the mild and loamy ones; if the amount of clay is excessive the soil must be made suitable by manuring. Strong clay soils are useless for beets, but clay-marl soils are good. Sandy soils are least adapted to the cultivation of the sugar beet, with the exception of loamy sand soil not deficient in humidity and the subsoil possessing enough water-holding power. Lime soils are, with the exception of loamy lime soil, not good for beets. From moist soils are raised good quantities, but poor qualities.

The best locations for sugar-beet-planting are on level or only slightly sloping lands, because work is done best on such lands and it is impossible for the beets to be swept away by heavy rains.

TRANSPORTATION, MARKET, AND LABOR.

Sugar beets are, in relation to their weight, cheap, and therefore it is not possible to transport them great distances. They should, therefore, be planted not far from the factory or the railway. The calculations of Settegast (Germany) show the influence of transportation upon beet-raising. His results show that, if 50 kilograms (112.5 pounds) of beets cost 25 cents, transportation on country roads costs 3¾ cents, and by rail 0.625 cents, for 1 German mile, or 4 English miles, therefore, beets are worth nothing if they must be carried 26.68 miles on a country road or 160 miles by rail.

It is very important to have laborers enough, as it is impossible to do all of the work by machinery. The best way to provide laborers is

to give them work the whole year—in winter in the factory, in summer in the field. One man (German) can do in a day's work of 10 hours and for a day's pay: Sowing by hand after the marker, 0.15 to 0.075 acres; cultivating the young plants, 0.75 to 0.10 acres; hilling up by hand, 0.15 to 0.20 acres; thinning out, 0.10 to 0.125 acres; harvesting and loading, 2,250 pounds. Contract work, one-third to one fifth more.

MANURING.

The sugar beet, of all the cultivated plants, needs the greatest amount of nourishment in the soil. It is, therefore, very necessary to use such a manure as will supply it with the best nourishment and in such a condition that it can be taken up by the beet. Possibly some soils are rich enough to do without manuring, but this seldom occurs. There are cases where beets have been raised in the same fields for 10 successive years without fertilizer, and yet good crops have been obtained.

The ability of the sugar beet to disclose and take up nourishment is not very high, and, therefore, if a large crop is desired, much manure must be used. Manure must be used that will increase the percentage of sugar as well as the quantity of the crop.

According to E. Wolff, in 1,000 kilograms of sugar beets are—

Constituents.	Roots.	Leaves.
	Kilograms.	*Kilograms.*
Water	815	897
Nitrogen	1.6	3
Ashes	7.1	15.3
Potassium	3.8	7
Sodium	0.6	2
Lime	0.4	3.1
Magnesia	0.6	1.7
Phosphoric acid	0.9	0.7
Sulphuric acid	0.3	0.8
Silicic acid	0.2	1.6
Chlorine	0.3	1.3

If we calculate per hectare (2.5 acres) 30,000 kilograms of beets (67,500 pounds) and 7,000 kilograms (15,750 pounds) of leaves, there is removed from the ground by beets—

Description.	Nitrogen.	Potassium.	Phosphates
	Kilograms.	*Kilograms.*	*Kilograms.*
Roots	48	114	27
Leaves	21	28	5
Total	69	142	32

STABLE MANURE.

The direct application of stable manure to the beet is not good, because the beet will then not ripen at the right time, and the quality will be poor. Stable manure should not be put in the soil in the spring. It should be plowed under in the fall. The manure of sheep is worth-

less, as it contains too much nitrogen and potassium, and the amount of salts in the beets is so increased that they are hardly fit for the factory. Manure of cattle can be used if mixed with that of horses. This manure contains sufficient nourishment, but the amount of nitrogen in proportion to phosphoric acid is too high. This should be 1 to 2, but in this manure it is just the contrary. The amount of manure usually needed per hectare (2.5 acres) is between 20,000 and 40,000 kilograms. According to a table by Wolff there is produced in the ground by applying 30,000 kilograms of manure 150 kilograms nitrogen, 78 kilograms phosphates, and 189 kilograms potassium. From this nourishment the result of applying freshly decomposed manure is, in the first year 35 to 50 per cent.; in the second year, 40 to 35 per cent.; in the third year, 25 to 15 per cent. An average crop of sugar beets (30,000 kilograms) needs 69 kilograms nitrogen, 32 kilograms phosphates, and 142 kilograms potassium. Compost is a very good manure, but it is not good to use any sugar beet soil in its preparation, as it may contain nematodes.

FERTILIZING.

In applying fertilizer, not only the crop but the quality of the beets will be better if it be used alone or employed to modify stable manure. Generally nitrogen, salts, and phosphates are used; exceptionally, potassium. According to P. Wagner the following amount of phosphoric acid and nitrogen should be used:

Description.	Minimum. per hectare.	Mean per hectare.	Maximum per hectare.
	Kilos.	*Kilos.*	*Kilos.*
Dissolved phosphates	40	60	80
Nitrogen	20	30	60

If nitrogen, as Chile nitsate, is used, then there will be needed 150 kilograms minimum, 250 kilograms mean, and 400 kilograms maximum.

TIME FOR MANURING.

Manuring should always be done as early as possible in the fall. The longer the manure has been in the ground before the vegetation of the beet the greater will be the amount of nourishment and its distribution. Experiments show that manuring in spring is wrong, and there are many reasons why. For instance, if the season is dry the manure can not decompose, the ground remains loose, and consequently the young plant suffers for water. On the other hand, as soon as a heavy rain comes after a drought the leaves grow very fast, but the plant does not ripen well, and a large crop is raised, but of a poor quality. If the manure is not decomposed, the work in the field can not be done in good shape, and insects have a good refuge. On heavy, loamy soils fresh manure is good for loosening it and allowing the air to enter.

How deep to put the manure.—It is best first to put the manure in the ground as shallowy as possible, because it decomposes better until the deep plowing is done. The more nitrogen the beet finds in the first period of its vegetation the better. The less nitrogen found in the ground in the first period the more will be taken up in the last period, and that means a loss for saccharification.

The following table shows, by the experiments of Liebscher, that the crop may be increased without losing in quality if the manure be properly applied and the beets planted closely:

Manure per hectare.	Sap.		Crop per hectare.
	Sugar.	Quotient in purity.	
	Per cent.	*Per cent.*	*Kilos.*
None	16.4	89.1	31,065
20,000 kilograms	16.3	87.4	34,785
30,000 kilograms	16.4	88.8	35,435
40,000 kilograms	16.2	89.1	42,100

The more nitrogen there is in the soil the less fertilizer will be required, but the more phosphate.

The increase of the crop by fertilizing with nitrogen is, according to experiments by Wagner, 100 kilograms Chile saltpeter with 15½ to 16 kilograms of nitrogen increases the crop about 4,500 kilograms of beets and 900 kilograms of leaves. Fertilizing with nitrogen should take place only when enough phosphate, lime, and potassium is in the soil, because large and good crops can only be expected when these substances are present. Whether enough phosphate is present can only be learned by experiment. Fertilizing with nitrogen should only be done in the spring. Chile nitrate should always be preferred, and the following rules should be observed:

(1) A good variety must be planted.

(2) Seeds should be obtained from the best sources.

(3) In addition to Chile nitrate, phosphate must be added, or the crop will mature too late.

(4) Fertilizing with Chile nitrate should be done before sowing, not after.

(5) Beets must be thickly planted and cultivated four or five times.

According to the calculations of Stutzer, the use of more than 400 kilograms to the hectare of Chile nitrate does not pay.

Professor Marker has experimented upon the influence of phosphates with the following results:

Phosphates do not always produce an effect. If the soil is supersaturated with it it can cause loss. This has often been observed by practical farmers. The cause is that P_2O_3 quickens maturity or causes an early death of the leaves, and that may lessen the crop, especially in a dry, rainless season.

Ten experiments have given the following results:

Fertilizer.	Crop per hectare.	Increase.
	Kilos.	*Kilos.*
Without phosphate (P_2O_5)	32,063	......
400 kilograms precipitate	34,456	2,393
Superphosphate (P_2O_5—76 to 80 kilograms)	35,346	3,283
400 kilograms Thomas slag	33,589	1,526
1,000 kilograms Thomas slag	34,756	2,693

There is not much difference in the effect of the various phosphate fertilizers so far as sugar in the beet is concerned. If it be necessary to use phosphate fertilizer in spring, superphosphate is always to be preferred.

SPREADING THE FERTILIZER.

Spreading broadcast has been found to be better than drilling.

There are, however, drills which have an attachment for drilling fertilizer.

It is very important to put the fertilizer in the right depth. Practical experiments have shown that it should not be used after sowing. In using Chile nitrate a shallow harrowing in sufficient, because the next rain will carry it deeper. Potassium and phosphate, which are absorbed immediately, must be put deep enough so that they will not evaporate. This can be done with a sharp harrow, or, better still, by shallow plowing. It is said that a depth of 20 to 22 centimetres is the best.

The following table shows the results of different depths in sandy loam per hectare:

Year.	Depth.		Difference.	
	10 to 12 centimetres.	20 to 22 centimetres.		
	Kilos.	*Kilos.*	*Kilos.*	*Per cent.*
1881	32,674	38,543	5,869	17.96
1882	36,217	39,030	2,813	7.77
1883	65,726	69,596	3,870	5.89

MIXED FERTILIZER (PHOSPHATE AND NITROGEN).

Of these are used, Peruvian guano (7 per cent. nitrogen to 10 per cent. P_2O_5), ammonia superphosphate, blood manure, with superphosphate. Bonedust is seldom used, as its effect is too slow; if used, it must be applied in the fall.

Although most soils have potassium enough, it may occur that lands where beets are raised every year may need it. The direct application of potassium salts to the beets is not good, because all these salts contain a chloride which injures the plants. The best is to give potassium mixed with stable manure two years before the beets are planted. When thus mixed the ammonia is kept from becoming volatile.

Lime.—Quicklime is a good fertilizer, especially on very heavy soils, which it loosens. For 1 hectare 24 to 40 kilograms should be used.

For sandy soils marl is excellent, the best containing 30 to 50 per cent of lime. The amount of marl needed for 1 hectare, if containing 30 per cent. of lime, is 220 kilograms; if containing 50 per cent., only 130 kilograms.

PREPARATION OF THE LAND.

The sugar beet needs well cultivated land. First, a surface loose and fine, which allows the air to enter and facilitates germinating and swelling; second, deep, loose, uniform soil, because the beet should develop a slender root without side rootlets. Both can be obtained only by good cultivation. Cultivation differs according to the soil.

The following suggestions are of value: Loosen the subsoil without bringing it to the surface. If the subsoil be not good, this is doubly important. The depth should be from 30 to 40 centimetres, and a plow similar to that shown in plate 3 should be used.

To begin deep plowing, 30 centimetres will be deep enough. After several years it may be made 40 centimetres, but should be deepened only gradually, because if too much dead soil comes up the land is ruined for at least one year. Deep plowing should always be done before winter, so that the frost has time to work on the soil.

Steam plowing.—By the introduction of the steam plow an implement was put into the hands of the farmer the work of which can not be equaled. The reasons why the steam plow works so well are—

(1) By the speed with which it operates the soil is well mixed and pulverized.

(2) The depth of all the furrows is the same.

(3) It plows to any depth, especially in heavy soils, which would require a large number of animals. Generally the soil is loosened to a depth of 35 to 40 centimetres, and the plants are enabled to take nourishment from a larger quantity of soil.

(4) In dry seasons soils plowed by steam retain longer their humidity. In wet seasons the water descends quicker to the subsoil. The steam plow increases the crop and renders it certain.

(5) The animals leave footprints (four oxen make about three hundred and sixty thousand in plowing 1 hectare), and therefore cause a not unimportant loss.

(6) It is possible to work in spring and fall, when with animals it would be impossible.

(7) A large number of animals can thus be used for other purposes.

If we consider that with a steam plow 3 hectares can be plowed in a day, while with a common plow one-third of a hectare can be gone over, then nine common plows are needed to do the work of one steam plow; and, as four oxen are needed for each plow, 36 oxen would be employed, and as they should be used only half a day, 72 oxen would be required, and their work is not equal to that of one steam plow.

The excellent work of the steam plow can increase the crop of beets

from 4,000 to 5,000 kilograms per hectare. The cost of plowing by steam is between $11 and $16 per hectare for a depth of 32 to 40 centimetres.

Deep plowing can be done in such a way that two plows go one after the other, the first cutting 15 to 20 centimetres deep and the second 10 to 18 centimetres.

Another way to loosen the deeper soil is as follows: The land is plowed from 15 to 20 centimetres, and laborers then spade up the deeper soil from 20 to 24 centimetres, the under soil being scattered over the surface. This method is expensive, but produces very good results.

Still another way to procure most of the advantages of deep plowing, and one which is generally used on very heavy soil or on lands exposed to inundations, which consequently dry at a late period, is to form ridges.

This is done in the fol... manner: The land is plowed in the fall in such a way as to form ridge. For ... purpose a hill plow is used, or a machine invented by Dr. Bärtel and ... "ridge former."

In spring these ridges are split, and thus ne... ridges are formed, These must be rolled to an even surface.

The advantages of preparing the land in this way are ... The water gathers in the furrows and runs off; the soil in the ridge is always in a good condition and the air can penetrate it.

If grain has been grown on land about to be planted in beets, the preparation goes on in the following way: The stubble is plowed as soon as possible to a depth of 5 to 8 centimetres. For this work gang plows are used.

As soon as weeds come up the land is harrowed and rolled. Before winter the deep furrow is plowed, and, if stable manure is used, it should be applied before the middle of November. In such cases only a moderately deep furrow is needed, because, as before remarked, the manure thus decomposes better.

The land remains in this state during the winter, and is therefore exposed to the influence of frost, rain, etc. In spring it is ready for the beets. Then, as soon as possible, it should be harrowed. The harrows used are, if the land is crusted, "the Extirpator," or if necessary it must be plowed 15 centimetres deep, then the "Acme" harrow is used.

If sugar beets follow beets, potatoes, or corn, the land is simply plowed before winter.

Before planting all land should be rolled.

PLANTING.

The time of planting influences the crop in a high degree.

It is shown that in a warm, dry season the crop of an early planting is larger than in a cold, humid season. The time of planting is the middle of spring, with a temperature of from 9° to 12° C. (48° to 54° F.). Early planting begins with April and lasts until the end of that

month; late plantings in May. In general, early planting is to be preferred, because the danger from frost is not so great as that of drought. It should always be remembered that the seeds should be put in a soil warm enough to germinate in 6 or 8 days, not 12 to 16 days, as is the case in cold, humid soil.

Distance apart.—This has a great influence on the crop and the quality of the beet. The experiments of Valmorin show that the largest crop will be grown if the beets be planted comparatively near together. If the distance increases, the proportion of leaves increases. The lighter and poorer the soil the farther must the beets be planted apart, and experiments show that this influence is greater than that due to manuring, or even the choice of the variety. Distances vary from 30 to 50 centimetres from row to row and from 10 to 25 centimetres in the row.

Depth for planting.—The seeds need only a very light covering—2 to 3 centimetres is the right depth. If part of the seeds are not covered at all it does not cause so much damage as if they are covered too deeply.

CULTIVATION.

From the time of planting up to that of harvesting the following suggestions should be observed: As soon as the sowing is done the roller must be used, because in pressing the surface the humidity, which is very necessary for the process of germinating, is drawn by capillary attraction out of the deeper soil, and the surface is thus kept moist. The roller may be smooth or have rings; the latter is better, because it makes the surface of the land rough, and therefore a heavy rain can not form a crust. If after sowing a crust covers the field the ring-roller is the best implement for breaking it, and after this a light harrow is recommended. Thus is the soil loosened, the air can enter, and germinating and growing are facilitated. When the plants have grown so that the rows are visible hoeing must be done, and the earlier the better, not only because the weeds are destroyed, but also because the plants need a loosened soil. The oftener the plants are hoed the better will be the crop as regards quantity and quality. Indeed, quantity and a high sugar percentage can only be obtained by hoeing. The first hoeing must be only superficial, that all the weeds are thrown on the surface to dry, and care must be taken that no soil covers the young plants. The hoeing should be done even if the land be dry, as hoeing prevents the evaporation of the water from the deeper soil. If laborers can be had, it is preferable to first hoe by hand in such a way that only the soil about 50 centimetres distant from the beet is hoed and the soil between the rows is untouched. This is then hoed with the cultivator. If hoeing must be done by horse-power a cultivator is used.

After the hoeing comes thinning out. This must be done as early as possible, and generally plants sowed by the Dippel machine must be

thinned out earlier than those planted by the drill, the reason being that the latter have more light and air than the former. It is practical to thin out when the plants have three or four leaves. The root is then as thick as a straw, and the whole plant has a length of 8 to 10 centimetres.

If planted with a drill, the work of cultivating can be done in two ways:

(1) The field is crossed with the cultivator at right angles to the rows, and the knives are set so that they leave about 2.5 centimetres on each side of the beet untouched. Of the plants which remain in this space the weakest are removed by hand.

(2) The whole work is done by hand. By means of hoes the laborers remove the superflous plants, leaving spaces about 20 to 25 centimetres between. Children are employed here for this work, as they can best get down to it.

Cutting the leaves off is not sufficient, as the leaves grow again; or, if not, the plant becomes a harbor for insects. One person can thin out one-ninth to one-eighth of an acre a day. After thinning, hoeing by hand should follow immediately to loosen the soil around the plants; then between the rows should be hoed, and the time this should be done depends upon the weeds and the soil. As a rule, the intervals should not be more than a fortnight. A fourth, and possibly a fifth, hoeing would increase the crop. Of course hoeing can not be done when the plants are large enough to be damaged.

Hilling up now follows. This must be done, because by covering the beets with soil it prevents the heads from growing out, and therefore this part of the root, which is of no value to the manufacturer as it contains little sugar, is lessened; water can run off and evaporate better, and the soil will not become incrusted. In heavy soils this is a very important point. The time for hilling up is important, as if this is done too early the plants are buried, and if too late the leaves are damaged. Hilling up can only be done when the soil is in good condition—*i. e.*, neither too wet nor too dry. For this a plow can be used with a single share, or that already shown in Plate 5. On small farms it is usually done by hand.

ENEMIES OF THE SUGAR BEET.

The insects which do the most damage to the root are—

(1) The larvæ of the May bug. Remedies are to collect the bug and leaves and encourage protecting birds and moles.

(2) The larvæ (wireworm) of the *Elater lineatus*. Remedy is to gather the leaves.

(3) *Atomaria linearis*. Remedy is not to plant successive crops of beets, and to wash the seeds in a liquid composed of 100 parts water, 5 parts Epsom salts, and 1 part of carbolic acid. In this fluid the seeds should remain 20 minutes.

(4) Caterpillars of *Agratis segetum* (Noctua *seq.*). Remedy is deep plowing and gathering the insect at night with a lantern.

(5) *Julus gullulatus et terrestris.* The remedy for this formidable-sounding insect seems to be like that in the preceding cases—*i. e.*, the best thing to do is to catch the bug.

(6) *Heterodera spachtie nematode.* This insect caused the disease of the soil which produced the so-called "fatigue of the beet." Remedy is to sow plants in which to catch the insects. The best is the *Ropia brassica rapaoleifera.*

Insects which damage the leaves are—

(1) *Silpha apaca.* Remedy, distribution of dead animals in the soil, as the larvæ prefer flesh.

(2) *Cassida nebulosa.* As this insect is attracted by the weeds the latter should be carefully removed.

(3) Larvæ of *Cleonus sulcirostris et punctiventris.* Remedy is its collection and remvoal.

(4) *Plusia gama.* Remedy, collecting.

(5) Larvæ of *Anthomya conformis.* Remedy is to hoe it on the surface where the birds can get it. Collect it with the leaves, if necessary, and burn them.

(6) *Hattica nemorum.* Remedy is to plant early enough that the plant can resist the attacks of the insect; also destroy them.

Parasites which injure the plant are—

(1) Rust, caused by *Aeromices betæ.* Remedy, the leaves of the beets used for raising seed, and which show attacks of the parasite, must be destroyed.

(2) Mildew of beets (*Peronospora betæ*). Remedy, beets used for raising seeds must be carefully selected and, if mildew is observed, the beet must be rejected. In spring, before planting, the same precautions must be again taken.

(3) Beet rot, caused by *Rhizætonia violacea.* Remedy, in storing, to separate the affected beets from the sound ones.

(4) Smut, caused by *Helminthis parium rezoctonia.*

(5) Leaf dryness, caused by *Dapazea betæcula.*

(6) Rot of the heart, caused by *Sporidium putrifacieum.*

(7) Rot of the beet.

It is possible that the sugar-beet may meet in the United States with a still more formidable enemy, though bearing a less imposing name, viz, the "sugar trust." No doubt, however, the remedy used in so many of the cases above mentioned may also be used here.

HARVESTING.

This is done when the beets are ripe, *i. e.*, when growing stops and all the products of the leaves go to root, where they are deposited. In Bohemia beets ripen from the end of September to the middle of October.

Signs of ripeness.—The leaves become yellowish green, fall, and form a kind of wreath around the plant. The middle leaves, so-called "heart leaves," also of a yellowish green, do not fall.

Harvesting should not be too early, as the loss occasioned thereby may amount to as much as 2 per cent. Of course harvesting must take place before heavy frost, though the beet can stand frost from 3° to 4° C. (24° to 27° F.). If early frosts should come, it is best to let the beets thaw in the soil, as the loss will be thus lessened.

How harvesting is done.—(1) By hand. To each man is apportioned a certain tract of land, which he works by contract. The soil around the plant is loosened, and then the plant is drawn from the ground by hand. Work with the fork would be easier, but might injure the beet.

(2) By team. A subsoil plow is used, which should be set for a depth of 35 centimetres. A still better implement is the beet-lifter. This machine can be worked by a boy, and also does not injure the plants, which are left loosely standing upright in their places, where they are better protected against sudden rain or frost than if lying upon the ground. As work can be done much faster with the lifter than by hand, this machine will no doubt be of much use in the United States.

Cutting off the heads.—The green heads must now be cut off, as they are of no use. This is done in the field, and here it is the work of women and girls, who accomplish their work rapidly, using sharp knives. About 1 to 2 centimetres of the beet is removed.

Piling up the beets.—This is necessary, as it is impossible to immediately transport an entire crop to the factory, and they must be protected from rot and frost. Perhaps the best plan is that recommended by Knauer, especially if the beets must remain a long time on the field. A ditch 1 foot deep and 6 feet wide is dug, and of the required length. Beats are then piled up with roots toward the center for a height of 1 foot and covered with 6 inches of soil. Then another layer of beets, covered also, is added, and then another, until the pile, tapering, is of the shape of a prism. If the soil is very dry, water should be applied. Beets so buried will keep six or seven months with little loss.

It is best to grow only one crop in 4 or 5 years on a single field, as otherwise the soil will be exhausted and insects and parasites increase, so that great losses would occur. Beets should follow grain or barley, and after the beet the best crop to plant is barley.

RAISING SEEDS.

If the beet industry were fully introduced into the United States one of the first subjects that our people would have to consider would be the raising of seeds, as in Germany and Austria the supply is only able to meet the present demand. The beets selected for raising seed should possess all the attributes of a good beet as previously described.

For ascertaining the proportion of sugar in the beet a piece is taken from the middle and the specific gravity of its sap found. This is, however, inaccurate, and the best plan is to submit the sap to polarization.

For raising seeds stable manure is unsuitable, but phosphate is highly recommended. This can be applied in the spring by grubbing. The cultivation of the beet then goes on in the manner already described. The seeds are ripe when they look meal-like if cut. The main sprouts ripen earlier, and therefore harvesting must begin with these. The plants are cut off with sickles, bundled up, and put away for drying. Threshing is generally done by hand, either on the field or at home. If done on the field, a cloth is spread, upon which the work is done. The seeds are then cleaned and ready for storing. If stored properly they should retain their generating power from 4 to 5 years. The crop from 1 hectare should be from 15 to 35 metre centners (3,360 to 7,740 pounds).

It should be mentioned that the seed beets, after being carefully selected, are buried in the ditches. In the spring these are carefully set out and cultivated with great care. Upon ripening the leaves are gathered and treated as above described.

Prof. Anton Veith, director of the agricultural college here, whose assistance has been invaluable to me in the preparation of this report, submits the following suggestions for the American farmer. As Professor Veith is thoroughly familiar with the subject of beet culture, and furthermore spent 2 years in America studying our farming methods from New York to California, his hints will be found practical. The professor also kindly expresses a willingness to answer any inquiries made to him on the subject of beet culture.

HINTS TO AMERICAN FARMERS.

[By Professor Veith.]

In traveling through the United States I was astonished to find that an industry so highly developed in the old country was nearly unknown there.

The influence of such an industry as the fabrication of sugar from beets exerts such a great influence upon a country that it deserves all the support of a great government.

In 1887 there was only one beet-sugar factory in the United States, and that was in Alvarado, Alameda County, Cal.

Upon inquiring as to the cause of this, I heard that several factories had been started in Illinois, but that after a few years had to be closed, as they did not pay.

I was told by the editor of a rural paper in Chicago that the soil was unfit for the purpose; by a professor in Kansas that beets would not grow containing a high enough percentage of sugar; by a chemist in Washington that the cultivation and manufacture had not been properly carried out.

The last opinion was undoubtedly the correct one.

The United States possesses soils of every kind, and in every State where wine and corn are grown it is surely possible to raise sugar beets.

But in raising sugar beets the American farmer, especially of the Western States, must get rid of the idea of always trying to save labor. Sugar beets need much work, but they pay double or treble as much as any other crop.

Localities are to be preferred where there is a large population, plenty of transportation facilities, providing always the climate and soil are suitable.

Raising sugar beets on a large scale, as is the case with grain in America, is impos-

sible, as labor is dear and it is impossible to get sufficient help for a few weeks' work. I think the plan adopted by Claus Spreckels, in California, is the best. Here small farmers who do their own work with little help raise the beets and sell them to the factory. A better plan would be for a number of such farmers to form an association and erect a factory themselves. We find such associations in Germany, and they do very well.

In order to stimulate the farmer to raise beets of a high sugar quality, the factory should pay in accordance with the sugar percentage, *i. e.*, to demand a certain percentage, say 9, and pay extra for any increase over this figure.

Raising sugar beets gives the farmer a chance not only to get more out of his land than possible with other products, but also improves his land for other products.

If the farmer sells the beets to the factory and gets back the pulp for feeding and perhaps the mud or lime, he loses very little of the mineral substance from his soil, as the sugar-producing substances are absorbed by the plants from the air.

Raising beets improves the land, because the thorough cultivation necessary brings it to a perfection never to be attained with other crops. The land will also be clearer of weeds.

In raising beets the whole agriculture of the country must be changed, *i. e.*, brought from an extensive culture to an intensive one.

In raising corn, grain, fodder, etc., the farmer uses only the upper part of his land and not the subsoil. If sugar beets are planted, the deeper soil is also placed at the service of the owner.

In connection with the improvement of the land, cattle raising is also improved, as the waste furnishes excellent fodder for milk as well as for fattening. An increase of manure can therefore be produced.

The first thing a farmer should do is to procure proper seeds, and these he should raise himself.

As implements are expensive, those should be procured which can be used for various purposes, as the universal plow of Sack.

For planting seeds it is recommended to try the corn-planter.

In closing I would only state that there exists a great future for beef culture in the United States (and I would recommend that careful experiments be made) and that the success which has already greeted Claus Spreckels in California be followed in other quarters.

Sugar-beet crop of Austria-Hungary.

Provinces.	Crop.			Planted in sugar beets.		Crop raised on 1 hectare.	
	1886.	1887.	1888.	1887.	1888.	1887.	1888.
	*Met. cent.**	*Met. cent.**	*Met. cent.**	*Hectares.*†	*Hectares.*†	*Met. cent.**	*Met. cent.**
Lower Austria	....	383, 760	730, 690	2, 578	2, 578	135	169
Bohemia	....	15, 301, 600	27, 400, 460	91, 830	120, 060	154	190
Moravia	....	7, 639, 650	10, 523, 930	51, 142	62, 800	137	152
Silesia	....	788, 630	887, 820	4, 024	4, 165	182	175
Galicia	....	444, 500	551, 450	4, 445	4, 625	100	120
Total	32, 984, 870	24, 558, 140	40, 094, 350	154, 019	194, 228	‡141.6	‡161.2

*1 metre centner=220 pounds. †1 hectare=2.47 acres. ‡ Average.

MANUFACTURE OF SUGAR.

We have now traced the cultivation of the beet from the preparation of the land to the moment when the root, minus its useless head, is ready for fabrication. In studying the subject of this report, then, I have to ask my readers who have accompanied me through the great

beet fields of Bohemia, where we have seen the various stages of cultivation, to now leave the farm and enter with me the greatest sugar factory in Bohemia. And here I may remark that, while this paper is not intended to give more than a superficial idea of the process of manufacture of sugar—and machinists and engineers are referred to the books mentioned for detailed information—I have found it necessary to go somewhat into technicalities and to employ plates to illustrate the various processes. Without this the general reader could not possibly get an intelligent idea of the subject.

Standing in the courtyard of the great factory referred to, we see wagon after wagon dumping its load, for each of which the farmer gets a receipt. No price has yet been fixed, but the farmer must sell to the factory, as beets can not stand transportation, on account of their weight, as already explained. The price will be fixed later by the manufacturer, who is, indeed, the Great Mogul of the neighborhood, and could exclaim with Napoléon: "*L'etat, c'est moi.*"

Through the middle of the court referred to runs a ditch lined with perfectly smooth tile, through which a rapid stream of water carries the beets to the washing machines, where all dirt and stones are removed.

It may be here remarked that while there are two ways of extracting the sap from the beet, viz, by pressure and by diffusion, only the latter is employed in this neighborhood. The advantages of the process of diffusion are: The cheaper plant required less workmen and force, ease of keeping apparatus in order, simple inspection of the work, its cleanliness, easy increase of work without corresponding loss of sap, and the entire absence of "press cloths." The only disadvantage is the great amount of water required, which limits such factories to those localities where sufficient water can be had.

The beets having been thoroughly cleaned, an elevator carries them to the top of the building and delivers them to the cutters, where ribbed knives reduce the beet to little cuttings like vermicelli. A railway carries this material and dumps it into the "diffuser." The diffuser is an iron, cylindrical tank, made to close tightly, and supplied with pipes above and below. Nine are usually connected together, and constitute what is called the "diffusion battery." This battery forms an important a part of the sugar factory.

Passing the first eight stages through which the beets pass in this battery, we come to the ninth, with which stage begins the regular work. From now on, of the nine vessels, eight are always working, while one is emptied and filled with fresh cuttings. Each diffuser, before being emptied, is completely isolated, by closing the valves, from the rest of the battery. The operation of the valves must be in precisely the order indicated. Failure to do this will cause disturbance. For instance, the closing of the valves *u* and *s* to the right is of importance, as otherwise the water and sap will become mixed, whereby leaching will take place

and evaporation rendered more difficult. Further, it should be taken as a general rule that the sap stream should enter every operating vessel from above, except in case of the vessel just filled, when the stream is reversed and ascends from below, in order to prevent formation of foam and to drive out all air from between the cuttings.

The temperature must be right in each diffuser, or the sap, as well as the pulp, will be injured. As the sap circulation proceeds without interruption, the principal steam valve remains always open, and the regulation of the temperature is controlled by the valves from the calorisator.

We will now suppose that the sap has been all extracted from the beet cuttings and has passed over to the saturator as a dirty-looking fluid with a disagreeable taste and smell. In the diffusers remain the pulp, now of no more use in the sugar process, but of much value in other respects. A trap in the bottom of the diffuser opens and the pulp is thrown into a slide, where moderate pressure removes the water as it passes downward to the cellar, to be used subsequently for fodder, for which it is admirably adapted, especially if mixed with substances containing fat and nitrogen, as oil cake, ground corn, etc. It is stored for use in ditches after being mixed with chopped straw, and is covered with straw and soil, being packed down as tight as possible. By being stored the pulp ferments and gains in digestive properties and flavor.

We now return to the sap, which has reached the saturator, a vessel made of block tin, the use of which is the removal of foreign substances and the saturation of the sap. The saturator is half filled with sap. Lime milk is now introduced, as well as steam and carbonic dioxide. The steam must be so controlled that the temperature of the sap slowly rises until at the close of the saturation it amounts to about 85° to 90° C.

The results of the treatment with lime and carbonic acid gas are as follows:

(1) The sap, previously dirty, dark, smelling of beets, more or less slimy, and slightly acid, becomes clear, light yellow, thin in consistency, alkaline, and emits an odor of ammonia.

(2) The sugar forms with the lime a saccharate, which however, under the influence of the CO_2, is immediately resolved.

(3) The nitrogen, holding portion of the sap, is resolved through the action of the lime.

(4) The nitrogen free organic acids, as ascetic and oxalic, are precipitated as salts of lime.

(5) Coloring matters are partly thrown down and partly remain in the solution. Dextrine combines loosely with the lime.

(6) Magnesia, oxide of iron, and phosphoric acid are precipitated, and sulphuric acid is also separated, while all the other mineral substances remain in the solution.

By this process, of 100 parts of foreign matter 40 to 50 will be re-

moved. The sap contains yet, however, many impurities, and the next step is to carry it through the filter press, which removes the dirt in the form of a cake. This cake is used for manuring.

A still more important means of cleaning, and one which removes the last of the impurities from the sap, is the filtration through animal charcoal or spodium. This spodium is a charcoal made of bone, and is used in pieces as small as a chestnut, or smaller.

The filter battery is composed of several filters made of block tin, from 18 to 30 feet high and from 1½ to 3 feet in diameter.

These are filled with spodium and are packed, to prevent cooling of the sap as it passes through. Over the battery are reservoirs for water and sap. The action of the spodium upon the sap is as follows: The sugar is taken up by the charcoal, but is only loosely held, and can be easily removed with water; saccharate of lime is rapidly seized upon and precipitated as hydrate of lime and free sugar; coloring matters are energetically absorbed and can not be washed out.

The remaining organic non-sugar substances are absorbed, but are not combined with equal force. A part enters into a chemical combination, while another part is only loosely retained by the spodium, and may be again washed out.

The salts act respectively in accordance with their chemical nature.

In spite of many experiments, no good substitute has yet been found for spodium as a filter material. After being used it is washed out and then thrown into a furnace and all impurities burned out, when it is again ready for use.

The sap must now be concentrated, and this is done by steaming and boiling until the right consistency is reached to favor crystillization. As a high temperature is objectionable, use is made of the well-known physical law that boiling takes place at a lower temperature in a vacuum apparatus.

The material is now let off into cooling pans, where crystallization begins, and from here the mass is poured into block-tin conical molds, and finally comes out as the familiar sugar loaf.

A second quality of sap is conveyed to the centrifugal machines, which revolve about a thousand times a minute, with the effect of causing the crystallization of a great ring of white sugar, while the balance is drawn off as molasses, no further crystallization being possible. These rings of sugar are crushed and packed in sacks for market, constituting the so-called "pilé."

I may now mention the existing

TAXES AND DUTIES ON SUGAR IN AUSTRIA.

According to the law of June 20, 1888, there must be paid a consumption tax on sugar, whether made out of raw material or the "reste" from sugar manufacture.

	Florins.
(1) Beet and all other sugars in every degree of purity, with the exception of sirup unfit for human use .... per 100 kilograms, net	11
(2) Sugar of any other kind:	
As a solid	3
As a fluid	1

Export indemnity.

From August 1, 1888, an indemnity is granted on exports of sugar of the first class—

	Florins.
(a) For 100 kilograms, net, from 93° to 98° of polarization	1.50
(b) For 100 kilograms, net, with at least 99.5° of polarization	2.30

If this indemnity should amount in one year to more than 5,000,000 florins, the manufacturers are pledged to return the balance to the Government.

Duty on imported sugar.

	Florins.
(a) Raw sugar under Holland standard No. 19 .... per 100 kilograms	15
(b) Raw sugar under Holland standard and higher than No. 19	20
Refined sugar	20
Sugar solutions, starch sugar, grape sugar (glucose), as a solid	15
Sirup (starch sugar, grape sugar, as a liquid) and molasses	6

This sirup must not contain any crystallized sugar, and must not crystallize if heated. If boiled two minutes it must reduce Soldaini's solution.

Statistics of the sugar-beet industry in Austria-Hungary.

Years.	Number of factories working.	Amount of beets.		Exports.		
		Notified.	Paid tax for.	Refined sugar.	Raw sugar.	Total in raw sugar.
		Met. cent.	*Met. cent.*	*Met. cent.*	*Met. cent.*	*Met. cent.*
1867–'68	151	12,165,753	10,854,380	....	....	....
1868–'69	162	9,409,232	7,934,382	5,258	2,452	8,762
1869–'70	181	14,107,376	12,291,160	149,438	362,646	541,972
1870–'71	215	18,538,173	15,931,191	369,762	400,897	844,651
1871–'72	251	16,114,062	13,624,246	213,594	396,840	653,153
1872–'73	256	20,418,912	17,333,189	233,433	455,262	735,382
1873–'74	244	16,166,107	13,773,879	293,867	495,465	848,105
1874–'75	226	11,634,409	9,852,973	299,939	264,007	623,934
1875–'76	231	14,969,313	12,780,932	398,775	609,334	1,087,864
1876–'77	227	17,105,561	14,891,538	385,633	688,371	1,151,131
1877–'78	229	26,310,864	22,846,002	567,300	988,440	1,669,202
1878–'79	226	30,926,289	28,287,800	809,915	1,088,559	2,060,457
1879–'80	226	28,975,077	26,252,919	605,835	1,546,142	2,273,144
1880–'81	227	47,308,640	44,097,228	880,095	2,113,493	3,160,564
1881–'82	230	46,280,701	42,806,785	891,022	1,204,814	2,274,040
1882–'83	232	51,345,805	48,862,203	1,257,466	1,387,934	2,896,893
1883–'84	230	44,856,566	41,845,679	1,251,786	1,105,021	2,607,164
1884–'85	229	46,087,950	43,401,900	1,291,065	155,648	3,704,590
1885–'86	212	28,458,837	26,151,015	1,164,486	683,607	2,080,990
1886–'87	217	45,589,629	42,870,875	1,697,822	1,010,382	2,896,861
1887–'88	207	35,226,999	32,263,262	1,243,418	502,349	1,883,926

Statistics of the sugar-beet industry in Austria-Hungary—Continued.

Years.	Receipts.			Total repaid for evaporated sugar.	Net amount of tax over duty.	Recovered by after payments.
	Tax on beets.	Duty.	Total.			
	Florins.	*Florins.*	*Florins.*	*Florins.*	*Florins.*	*Florins.*
1867-'68	7, 352, 266	16, 010	7, 368, 276	1, 805, 117	5, 563, 159	....
1868-'69	5, 802, 017	267, 600	6, 069, 617	77, 528	5, 992, 089	....
1869-'70	8, 987, 911	23, 886	9, 011, 797	4, 742, 147	4, 269, 650	....
1870-'71	11, 649, 684	10, 056	11, 659, 740	7, 306, 653	4, 353, 087	....
1871-'72	9, 962, 730	14, 482	9, 997, 212	5, 817, 097	4, 180, 115	....
1872-'73	12, 674, 894	23, 032	12, 697, 926	6, 410, 106	6, 287, 820	....
1873-'74	10, 072, 149	23, 400	10, 095, 568	7, 152, 491	2, 943, 067	....
1874-'75	7, 190, 361	10, 646	7, 201, 007	5, 458, 683	1, 742, 324	....
1875-'76	9, 330, 081	7, 354	9, 446, 744	9, 472, 991	—26, 247	....
1876-'77	10, 870, 823	5, 364	10, 876, 187	10, 479, 973	396, 214	....
1877-'78	16, 677, 581	8, 477	16, 686, 058	15, 335, 217	1, 350, 841	....
1878-'79	20, 050, 094	6, 761	20, 656, 855	18, 960, 724	1, 696, 131	....
1879-'80	19, 164, 634	11, 150	19, 175, 784	20, 843, 110	1, 667, 326	4, 303, 869
1880-'81	35, 277, 783	8, 462	35, 286, 245	29, 994, 247	5, 291, 998	8, 167, 326
1881-'82	34, 375, 531	14, 862	34, 290, 393	21, 608, 839	12, 781, 554	4, 708, 002
1882-'83	39, 090, 503	10, 593	39, 101, 156	27, 563, 813	11, 537, 343	....
1883-'84	33, 476, 543	8, 782	33, 485, 323	24, 833, 009	8, 652, 111	....
1884-'85	34, 721, 521	7, 112	34, 728, 521	35, 173, 673	—445, 041	1, 810, 546
1885-'86	20, 920, 812	7, 085	20, 927, 897	19, 865, 085	1, 062, 812	12, 045, 041
1886-'87	31, 296, 700	6, 155	34, 302, 855	29, 098, 681	5, 204, 174	10, 937, 188
1887-'88	25, 810, 610	5, 947	25, 816, 557	19, 979, 946	5, 836, 611	6, 968, 389

THE SUGAR FACTORY.

The manufacture of sugar can only be carried on on a large scale. It is a great advantage for the manufacturer to own and conduct his own plantation. Water is a prime requisite, and an important matter, also, is the disposal of the water after it has been used, as it is then capable of destroying a stream for all further uses, and this would cause endless suits and annoyances. The water should be conveyed into ponds where it may evaporate or sink into the ground, or, better, distributed over the fields. The factory should be so situated that coal can easily and cheaply be obtained and the goods profitably shipped to market. It is, however, more important that it be in the immediate neighborhood of the plantation. A middling sized factory requires about 300 workmen. As the factory only works about 5 months, it is necessary, in order to secure permanent help, to employ the laborers in the field also.

THE BUILDING.

While it is not my purpose to go into the architectural features, I desire to introduce here the accompanying admirable plan, not only as exhibiting a model factory building, but as showing the relative location of the apparatus as described in the foregoing pages. The building should be in the form of a cross, with a great central rotunda.

Summary of sugar factories in Austria-Hungary.

Description.	Bohemia.	Moravia.	Silesia.	Lower Austria.	Galicia.	Hungary.	Total.
Sugar factories:							
Working	138	50	9	3	1	14	215
Not working	7	....	....	....	....	4	11
Refineries:							
Working	10	4	1	....	....	....	15
Not working	....	....	....	....	....	....	....
Total	155	54	10	3	1	18	241
Sap extraction:							
By diffusion	138	50	9	3	1	14	215
By pressing	....	....	....	....	....	....	....
Production:							
Only raw sugar	120	33	5	1	....	4	163
Raw sugar and white goods	20	17	3	2	1	8	51
Only white goods	8	4	1	....	....	....	13
Only pilé	1	....	....	....	....	2	3

JOHN B. HAWES,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Reichenberg, November 8, 1889.

FRANCE, 1874.

REPORT BY CONSUL-GENERAL TORBERT, OF PARIS.

The manufacture of beet-root sugar began in 1812, in consequence of the continental blockade. It constitutes now one of the most important products of France. It is almost entirely confined to the five departments of Aisne, Nord, Oise, Pas-de-Calais, and Somme. Out of 508 establishments engaged last season 181 were situated in the single department of the Nord, 92 in Pas-de-Calais, 60 in the Somme, 39 in the Oise, 89 in Aisne, and 47 divided among eight other departments.

The following table illustrates the development of this product during the past few years:

	Pounds produced.
1868	304,950,533
1869	533,843,890
1870	612,285,762
1871	741,294,545
1872	828,041,146
1873	916,511,742
1874	957,581,885

Sugar refining has also considerable importance, and constitutes a very large item of revenue.

A. T. A. TORBERT,
Consul-General.

UNITED STATES CONSUL-GENERAL,
Paris, October 30, 1875.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B

DENMARK.

DENMARK—1886.

REPORT OF CONSUL RYDER, OF COPENHAGEN.

The rapid and very great development which has taken place in the manufacture of beet sugar in this country in the last years, namely, from 4,000,000 pounds in 1880 to over 20,000,000 pounds in 1884, has been a source of material benefit in these times of unusually low grain prices to the agricultural classes, more especially to the agriculturists located in the vicinity of the districts where the large sugar refineries have been erected. These parties have been anxiously seeking every opportunity for bringing an increased area of their lands under culture of these roots; but unfortunately, with the simultaneous depression which has been felt in the sugar markets, due, in great measure to the large exports from Germany and France under the protective influence of the sugar-export bounties, the owners of the large sugar refineries in this country have found themselves compelled to refuse to enter into fresh agreements for any increased areas, upon conditions of similar nature to those contained in still running contracts. Taking further into consideration the present unfavorable aspect of the world's sugar markets, they have decided to limit all new contracts to the term of 1 year's duration, as likewise to call for a reduction of about 2¾ cents per hundredweight of roots on the prices hitherto paid. The fresh agreements thus determined upon by the owners of the refineries have produced a feeling of sad disappointment amongst a large number of the older contractors. They had commenced operations upon a small scale, with the view of first acquiring full experience in the cultivation of this product, but with the full expectation that if the results responded favorably to their hopes, that they would then be enabled to place under the same culture such increase of area as might be fairly counted upon for a reasonable supply to the sugar works.

Again, many husbandmen, who with still greater caution had not ventured to embark at once in the same undertaking, but had preferred first to watch the results obtained by their neighbors before they also took part in the culture, now that the yearly returns have so plainly demonstrated the great advantages that have been derived by their neighbors from the culture of sugar beets during the present low prices of grain, are also anxiously looking forward to a greater development in this branch of agriculture, in which they may likewise be enabled to participate.

With the somewhat firmer tone of the sugar markets during the latter part of the expired year, a more hopeful feeling seemed to spring up among the cultivators, and it was generally felt by them that the opportunity should not be allowed to slip away without some attempt being made to obtain terms of such favorable nature as would justify

them in bringing a greater extent of area under culture of these roots; and they more especially were of the opinion that such prospects might be more easily realized when they could at the same time offer to the different newly-established refineries at Nakskov Stege and at Assens such a collective extent of area that the manufacturers could obtain full security for the carrying on of their works without interruption throughout the whole working campaign. At a numerously attended meeting lately held in the principal sugar-beet district it was unanimously resolved to send a deputation from the growers, who should without delay seek to enter into negotiation with the proprietors of the sugar refineries with the view of establishing a basis of agreement leading to an increased area being brought under culture of these beets upon terms of mutual advantage to the refiners as well as to growers.

It was suggested at this meeting that, as a starting point in these negotiations, it would be desirable first and foremost to seek to establish a fixed connection between the prices of sugar and the prices of the sugar beets, in such manner that, with a stipulated price of sugar according to the quotations of the London market, the growers should receive the hitherto normal prices paid for the roots (21.44 cents per hundredweight of roots without regard to their saccharine contents, or else 20.10 cents—an extra payment of 1.34 cents percentage of saccharine in the roots, over and above 12 per cent.; as also the respective prices of 22.25 and 23.30 cents after the 15th November and 15th December); and with a decline in the price of sugar, that a fixed scale should be regulated for a corresponding reduction in the price to be paid for the roots; or, again, that a somewhat lower price for the roots (say of 1.34 cents per hundredweight) might be fixed, the same to be maintained without regard to any corresponding fluctuations in the sugar market.

It would appear to have been the general feeling of all who attended this meeting that it could not be too forcibly impressed upon the minds of those who might be delegated to take part in these negotiations, that no satisfactory and lasting arrangement could be looked for unless the interest and welfare of the refineries were taken into consideration equally as well as those of the growers.

Meetings have been subsequently held in the less important sugar-beet districts, where it was also unanimously resolved to send delegates who should coöperate with the deputation from the first-named district.

Although the yield of sugar beets per area of land at Assens was stated to have been considerably less than that obtained on the islands of Moën and Leolard it was nevertheless fully acknowledged at the meeting held at that place that a greater development of the culture of these roots was a matter of great pecuniary importance under the present agricultural depression, and that it was therefore most desirable that all endeavors should be made towards bringing an increased areal under culture of these roots. The parties so deeply interested in the prosperity and further development of this branch of industry would

appear to have taken very sensible and practical steps towards arriving at an amicable arrangement, and it is to be hoped that with a mutual display of good will on the part of refiners as well as growers, that such satisfactory basis may be agreed upon as may allow of an increased areal to be brought under this culture, and that all parties concerned may find themselves in a position to tide over this seemingly interminable period of trade depression.

HENRY B. RYDER,
Consul.

UNITED STATES CONSULATE,
Copenhagen, March 25, 1886.

GERMANY.

GERMANY—1861.

REPORT BY CONSUL SUNDELL, OF STETTIN.

Formerly a good number of United States vessels entered here yearly, bringing either whale oil, rosin, dyewood, and turpentine from there, or raw sugars from the West Indies, and coffee from Brazil. But the price of the first article having advanced so much that it could not be purchased any longer, it has been replaced by the flax and the rape-seed oil, now extensively manufactured in this country; and from a singular protection given the fabrication of sugar made from the white-beet root, a discovery deserving its own chapter, the importation of the India sugar has become almost prohibited all over the German states.

Since the introduction of beet-root sugar within the "Zollverein" much thought has been devoted to the subject, and frequent conventions have exhausted themselves in deliberations over how to raise sufficient revenue from the product, and at the same time protect the manufacturers thereof. In the latter they have undoubtedly succeeded, but the people have now a poorer sugar at higher prices than before, and it is being demonstrated that the Prussian Government now receives some two million thalers less in revenue from the article (sugar) than during the time when colonial sugar was imported. Thus we have the significant fact of how a comparatively few favored individuals are allowed to grow rich at the expense of the national treasury and the people at large. It is now thought, however, that when, with the termination of the present "Zollverein" in 1865, this protection also shall have ceased, it will not be reëstablished again on the same terms, but the beet root will then be left to compete with other saccharine matters, and colonial sugars will once more be brought to the German markets. It is also argued that, with a change in the Prussian ministry in favor of free trade, the protection of the beetroot fabrication, as far as Prussia is concerned, would at once be slackened so as to allow other sugars to come in for competition.

STETTIN, *March* 31, 1862.

GERMANY—1864.

Amount of duty on foreign sugar and beet-root sugar in the Zollverein from April 1, 1863, to March 31, 1864.

	States.	Sugar paid import duty.							
		Loaf sugar.		Brown or raw sugar.		For home refineries.		Sirup.	
		Importation.	Duty 477½ per cwt.	Importation.	Duty.	Importation.	Duty.	Importation.	Duty.
		Zoll. lbs.	*Thalers.*	*Cwt. lbs.*	*Thalers.*	*Cwt. lbs.*	*Thalers.*	*Cwt. lbs.*	*Thalers.*
1	Prussia	398.55	2,922	220 60	1,323	295,178 97	1,254,510	42,152 7	105,380
2	Luxemburg	.83	6	3	....	....	....	137 56	343
3	Bavaria	415.05	3,043	58 7	348	....	....	1,817 23	4,543
4	Saxony	155.31	1,138	17 27	103	67 58	287	10,108 64	25,271
5	Hanover	550.01	4,033	79 8	474	64,057 17	272,242	24,116 11	60,290
6	Wurtemburg	244.00	1,791	4 13	24	....	....	437 18	1,092
7	Baden	285.55	2,094	1 80	10	15,026 47	63,862	983 15	2,337
8	Hesse Cassel	20.88	153	4	1,035	....	....	94 68	236
9	Hesse Darmstadt	83.26	610	172 57	....	....	....	1,047 87	2,618
10	Thuringia	25.51	187	37	2	....	....	2,336 12	5,840
11	Brunswick	6.40	46	2 89	17	....	....	2,250 24	5,625
12	Oldenburg	242.00	1,774	4 70	28	....	....	3,587 9	8,967
13	Nassau	42.58	312	1 95	11	....	....	....	....
14	Frankfort-on-the-Main	5566	408	96	5	....	....	457 18	1,142
	Total	2,525.82	18,517	564 46	3,380	374,330 19	1,590,901	89,476 62	223,684

	States.	Beet root paid duty.		Total duty.	Bonifications for sugar exported.	Net balance.
		Beet root.	Duty.			
		Cwt. lbs.	*Thalers.*	*Thalers.*	*Thalers.*	*Thalers.*
1	Prussia	34,189,599 50	8,547,390	9,911,537	374,731	9,636,806
2	Luxemburg	405,304 00	101,323	350	....	350
3	Bavaria	80,070 00	20,017	109,261	....	109,261
4	Saxony	142,455 00	35,613	46,819	....	46,819
5	Hanover	1,184,795 50	296,198	372,655	2,480	370,175
6	Wurtemburg	987,303 00	246,825	209,108	....	299,108
7	Baden	13,790 00	3,447	315,131	....	315,131
8	Hesse Cassel	243,950 30	....	3,838	....	3,838
9	Hesse Darmstadt	2,420,721 50	60,989	4,264	....	4,264
10	Thuringia	....	605,180	67,020	1,100	65,920
11	Brunswick	....	....	610,870	151,185	459,686
12	Oldenburg	....	....	10,771	....	10,771
13	Nassau	....	....	324	....	324
14	Frankfort-on-the-Main	....	....	1,557	....	1,557
	Total	39,667,997 50	9,916,999	11,753,506	429,494	11,324,010

Quantity of raw beet root worked into beet-root sugar from September 1, 1863, to August 21, 1864.

States.	No. of factories.	Beet roots paid duty.				
		From Sept. 1 to Dec. 31, 1863.	1st quarter, 1864.	2d quart'r 1864.	July and Aug. 1864.	Total.
		Zoll. lbs.	*Zoll. lbs.*	*Zoll. lbs.*	*Zoll. lbs.*	*Zoll. lbs.*
Prussia	221	20,084,713.00	19,933,897.50	166,285	2,495	34,187,290.50
Luxemburg	.....	.....	.....	.....	.....	.....
Bavaria	6	234,599.00	169,510.00	18,335	.....	422,244.00
Saxony	1	47,785.00	32,285.00	.....	.....	80,070.00
Hanover	1	90,300.00	52.155.00	.....	.....	142,455.00
Wurtemburg	6	648,208.14	560,440.00	82,639	.....	1,247,287.14
Baden	1	323,163.00	291,504.00	350,325	179,480	1,144,472.00
Electoral Hesse	1	.....	13,790.00	3,570	.....	17,360.00
Hesse Darmstadt	.....	.....	.....	.....	.....	.....
Thuringia	2	125,597.00	118,362.00	1,551	.....	245,510.00
Brunswick	14	1,370,311.50	1,050,411.00	3,910	.....	2,424,631.50
Oldenburg	.....	.....	.....	.....	.....	.....
Nassau	.....	.....	.....	.....	.....	.....
Frankfort	.....	.....	.....	.....	.....	.....
Total	253	22,924,576.64	16,178,353.50	626,615	181,975	39,911,520.14
Total in 1862-'63	247	21,740,040.80	14,398,833.56	428,393	151,992	36,719,258.86
In favor of 1863-'64	6	1,184,536.34	1,779,519.94	198,222	29,983	3,192,261.28

GERMANY—1865.

REPORT BY CONSUL KLANPRECHT, OF STUTTGART.

Owing to a very poor crop of sugar beets, the sugar factory at Stuttgart consumed last year only 192,000 centners of beets, (265,000 in 1864); the manufactory at Heilbronn, 314,982 centners. The total value of the product of the latter establishment was 650,000 florins. Prices were for prime, 28½ florins; farin, 20½ florins; molasses, 2 florins. Stockholders received a dividend of 15 per cent. on their investments, the highest ever divided since the foundation of the establishment in 1855. Up to this year an average profit of 6 per cent. only was attained. The manufactories of Zuttlingen and Althausen do not show more favorable results. The market price of beets remained stationary. This year, also, the prospects are improving, the returns of the crops indicating an abundance of beets; higher prices of sugar, therefore, can not be expected.

There were raised in the Zollverein States last year 41,641,204 centners of beets, producing a total value of 100,000,000 of florins. Manufactories and quantities of their consumption in 1865 are distributed as follows through the States of the Zollverein:

States.	No.	Quantity of beets.	Product.
		Centners.	*Centners.*
Prussia	234	35,623,805	153,093
Bavaria	6	363,071	60,512
Saxony	1	84,400	84,400
Hanover	1	126,020	126,020
Wurtemberg	5	1,104,408	220,881
Baden	1	1,085,371	1,085,371
Hesse Cassel	1	29,376	29,376
Thuringia	2	211,055	105,527
Brunswick	18	2,818,698	156,316
Total	269	41,441,204	2,021,496

Eleven and a half centners of beets on an average furnish a centner raw, or 82 pounds, of refined sugar. There were produced from 41,641,204 centners of beets 2,869,200 centners of refined sugar, at a value of 89,076,000 florins. In reality a larger quantity of refined sugar was made; the secondary products, viz., molasses, residue from pressed beets for fattening animals, also being of some value.

According to the same rate, Würtemberg last year should have produced 78,784 centners of refined sugar, at a value of (30 florins per centner) 2,362,440 florins; or, including the surrounding products, of 2,500,000 florins.

EMIL KLANPRECHT,
Consul.

UNITED STATES CONSULATE,
Stuttgart, April 30, 1866.

GERMANY—1867.

The harvest of sugar beet will be about one-fourth larger than last year. Prices are from 28 to 30 kreutzers per centner. Manufacture of beet sugar did not prove remunerative last season. Overproduction of the article, together with the unfavorable state of monetary affairs, caused a reaction in prices to a lower rate than ever was heard of before. Many sales did not bring the cost of manufacture. Orders from France and England to the amount of 1,000,000 centners prevented a still greater reduction of prices. Sales are, for prime, 26½ florins; farin 20½ florins per centner. Last year the 6 factories at Würtemberg con, sumed 1,636,097 centners of beet root.

EMIL KLANPRECHT,
Consul.

STUTTGART, *December* 31, 1867.

GERMANY—1861-1878.

REPORT BY CONSUL-GENERAL KREISMANN, OF BERLIN.

The cultivation of sugar beets steadily continues to grow in importance, and the manufacture of beet sugar has fairly become one of the leading and most profitable industries in this country. Only forty years ago no more than 20,000 acres were planted with beets, while at the present time nearly 400,000 acres of land are devoted to that purpose per annum. For fuller particulars I beg to refer to the following table:

Return of beet-sugar production in the German Zollverein.

Years.	No. of factories in operation.	Beets manufactured into sugar.	Raw sugar produced.
		Cwt.	*Cwt.*
1860–'61	247	29, 354, 032	2, 530, 520
1861–'62	247	31, 692, 394	2, 515, 269
1862–'63	247	36, 719, 259	2, 760, 847
1863–'64	253	39, 911, 520	3, 023, 600
1864–'65	270	41, 641, 204	3, 413, 214
1865–'66	295	43, 452, 773	3, 713, 912
1866–'67	296	50, 712, 709	4, 024, 818
1867–'68	293	40, 593, 392	3, 300, 276
1868–'69	295	49, 953, 656	4, 162, 805
1869–'70	296	51, 697, 733	4, 307, 645
1870–'71	304	61, 012, 912	5, 259, 734
1871–'72	311	45, 018, 363	3, 728, 838
1872–'73	324	63, 631, 015	5, 251, 021
1873–'74	337	70, 575, 277	5, 820, 813
1874–'75	333	55, 134, 902	5, 128, 247
1875–'76	332	83, 225, 683	7, 160, 964
1876–'77	328	71, 000, 731	5, 788, 453
1877–'78	329	81, 819, 360	7, 560, 181

As a matter of commercial interest it may also be stated that of the total quantity of raw sugar refined by the 64 sugar refineries existing in this country, 4,420,954 cwt. were beet sugar, while the remainder, cane sugar, amounted to only 3,699 cwt.

H. KREISMANN,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Berlin, November, 1879.

GERMANY—1871.

REPORT BY CONSUL-GENERAL SPRAGUE, OF BERLIN.

The manufacture of beet sugar is an extensive and important branch of the industry of Brunswick. There are 25 factories and 7 refineries, whose aggregate product for the year 1870–'71 was 21,000,000 kilos, valued at 5,000,000 thalers. To produce this amount of sugar 255,000,000 kilos of beets were consumed. As the average product of a hectare is about 27,500 kilos of beets, it appears that more than 9,272 hectares, or about 22,913 acres, of this little state are devoted to the cultivation of the sugar beet. The average percentage of sugar in the beets is 8, and they cost, delivered at the factory, 18 silbergroschens per 50 kilos, which includes the tax of 8 silbergroschens. The present *en gros* price for best refined is $10\frac{1}{2}$ thalers per 50 kilos. There is also a tax of $3\frac{4}{30}$ and $3\frac{18}{31}$ thalers, according to the grade, on all raw sugar manufactured; but a drawback is allowed on exported sugar. The exports of this article are chiefly to England, Switzerland, Italy, Sweden, Russia, and Holland, and now and then an invoice goes to the United States. During the past year but one invoice of sugar was verified at this office, and the value was only $363\frac{4}{30}$ thalers. The process for the production

of beet sugar has been brought to a very high state of perfection in the Duchy of Brunswick. The net earnings of some of the factories last year were from 50 to 85 per cent.

Through the kindness of Herr Eberh Mencke, of this city, I am enabled to prepare the following table, showing the amount (in kilos) of beet sugar produced in the several states of Europe during the last 6 years:

States.	1870-'71.	1869-'70.	1868-'69.	1867-'68.	1866-'67.	1865-'66.
France	295,000,000	285,150,000	213,900,000	225,000,000	216,850,060	274,000,000
Germany	252,000,000	215,400,000	208,150,000	165,000,000	201,250,000	185,700,000
Austria and Hungary	190,000,000	152,200,000	101,600,000	124,050,000	90,000,000	71,050,000
Russia and Poland	185,000,000	132,500,000	87,500,000	112,500,000	90,000,060	80,000,000
Belgium	55,000,000	43,550,000	87,100,000	31,050,000	39,125,000	41,550,000
Holland, Sweden, Italy, and other states of Europe not mentioned	25,000,000	12,500,000	10,000,000	7,500,000	5,000,000	4,000,000

DE WITT C. SPRAGUE,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Berlin, October 9, 1871.

GERMANY—1871.

Insignificant quantities are imported of colonial sugar, and it becomes daily rarer in this country. Beet sugar has entirely removed the colonial sugar, and the former is alone used for general consumption. The beet sugar manufactories are increasing from year to year. Those of this city have produced 294,266 centners, and the rate of duty is 8 silbergroschen of 100 pounds raw beets.

GEO. HOLSCHER,
Consul.

BRUNSWICK, *October* 16, 1871.

GERMANY—1875.

REPORT BY CONSUL-GENERAL WEBSTER, OF FRANKFORT.

The sugar manufacture has now become a staple business in Germany. There are now 341 manufactories in Germany, more than one-half of which are in the Saxon provinces. In Würtemberg, 6; in Bavaria, 2; and Baden only 1. The manufacture of this article has grown from 100 establishments, making 124,000 centners, in 1842, to 341 establishments, making about 4,000,000 centners of sugar annually. In 9 months, from September 1 to June 1, 1875, 55,072,412 centners of beet sugar were raised in Germany, which pays a tax of about 18 cents per

centner, while during the same period in 1873–'74 more than 70,000,000 centners were raised, being a decrease of 20 per cent. In consequence of this extent of production in the last 10 years the consumption has so much increased that while for 30 years only five pounds of sugar to a person could be reckoned, now ten pounds can be reckoned annually. In addition to this, about 25 per cent. of the production is exported.

WILLIAM P. WEBSTER,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Frankfort-on-the-Main, November 10, 1875.

GERMANY—1878.

Of the agricultural products the sugar-beet continues to be a leading staple. The beet crop of the last and the immediately previous season is shown in the following exhibit:

***Return of the beet-sugar production of the year from September* 1, 1877, *to August* 31, 1878.**

[GERMAN ZOLLVEREIN.]

Countries and districts.	Factories on Sept. 1—		Beets manufactured into sugar during the year ending Aug. 31—	
	1877.	1876.	1878.	1877.
I. Kingdom of Prussia:			*Cwt.*	*Cwt*
1. Province of West Prussia	1	1	243, 415	261, 570
2. Province of Brandenburg	17	18	2, 634, 850	1, 982, 325
3. Province of Pomerania	6	6	1, 225, 830	896, 810
4. Province of Posen	1	1	346, 250	325, 605
5. Province of Silesia	47	47	10, 740, 583	8, 417, 180
6. Province of Saxony with the principality of Schwarzburg	140	141	39, 134, 712	34, 100, 651
7. Province of Schleswig-Holstein	1	1	284, 540	264, 733
8. Province of Hanover	27	26	6, 261, 430	5, 566, 965
9. Province of Westphalia	2	1	128, 415	102, 360
10. Province of Hesse-Nassau	1	1	108, 400	93, 955
11. Rhine province	8	8	2, 882, 895	2, 699, 420
Total Prussia	251	251	63, 493, 820	54, 711, 574
II. Bavaria	2	2	292, 105	246, 000
III. Würtemberg	5	5	1, 064, 762	1, 058, 172
IV. Baden	1	1	896, 030	292, 721
V. Mecklenburg	2	1	411, 290	174, 936
VI. Thuringian States	5	5	1, 164, 542	978, 913
VII. Brunswick	29	29	6, 454, 689	6, 008, 620
VIII. Anhalt	83	82	8, 489, 540	7, 336, 995
IX. Luxemburg	2	2	142, 190	192, 800
Grand total	330	328	82, 407, 868	71, 000, 731

H. KREISMANN,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Berlin, November 30, 1878.

GERMANY—1878.

REPORTS BY CONSUL-GENERAL KREISMANN, OF BERLIN.

The quantity of beet taxed and used in the manufacture of sugar amounted in the harvest of September–August, 1876–'77, to 70,949,323 cwt., as against 83,225,683 cwt. in the preceding year, showing a decrease therefore of nearly 15 per cent. Along with this falling off in the yield there was a still greater decrease in the production in France and in the other countries, so that the prices toward the end of 1876 reached quite an extraordinary height, and the consumption of sugar experienced considerable reductions. The exports of German raw sugar have therefore in the last year attained dimensions never before reached. According to the returns of exports, which at present are submitted up to the end of August, the sugar trade and sugar consumption of Germany show the following results as compared with those of the preceding years:

Harvest.	Production of beet sugar.	Imports.	Exports.	Consumption.
	Cwt.	*Cwt.*	*Cwt.*	*Cwt.*
1874–'75	5,128,547	568,930	240,250	5,457,927
1875–'76	7,160,964	426,489	1,147,820	6,439,633
1876–'77	5,800,000	163,900	1,162,620	4,801,300

Notwithstanding the diminished production, the export of beet sugar from Germany has yet experienced an increase, the home consumption on the other hand remaining behind that of the year 1875–'76 by about 1,600,000 cwt. With the simultaneous falling off in the beet sugar productions in France the home-sugar manufacturers have, however, been sufferers in a less degree than the state or rather the customs department. The increased demand of France and of England for foreign raw sugar gave the German manufacturers toward the end of last spring an opportunity to dispose of a large quantity of their stock at a pretty good profit and thus to equalize the decrease in production by higher prices. The state, however, in the last year has not only lost so much in duties on sugar as the production of sugar has diminished, but also in proportion as the exports have increased. The falling off in the production amounts to about 1,400,000 cwt., which would represent a duty of some 13,000,000 of marks. The sugar-beet crop of Europe is estimated as follows:

	1877–'78.	1876–'77.	1875–'76.
	Tons.	*Tons.*	*Tons.*
Germany	355,000	291,204	346,645
France	325,000	243,295	450,877
Russia and Poland	250,000	250,000	245,000
Austria-Hungary	235,000	205,267	180,140
Belgium	60,000	44,407	79,795
Holland and others	25,000	25,000	30,000
Total	1,250,000	1,059,233	1,332,457

This branch of agriculture has experienced an enormous development within the last twenty-five years. In 1850 the number of raw-sugar factories was 184, and the mass of sugar beet manufactured into sugar 14,750,000 hundred-weight, whereas in the years 1874–'75 333 factories were in operation, using up more than 55,000,000 hundred-weight of beet sugar.

H. KREISSMANN,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Berlin, November 26, 1877.

GERMANY—1881.

REPORT BY CONSUL-GENERAL BREWER, OF BERLIN.

Concerning the beet-sugar industry, a few explanatory remarks may not be out of place. How much the influence is appreciated of the cultivation of sugar beets upon agriculture and national welfare may be seen from a few passages extracted from a very valuable treatise by Richard von Kaumann on sugar industry (published by L. Guttentag—D. Collin, Berlin), in which it is stated that—

It is an established fact that notwithstanding the extensive cultivation of sugar beets, no decrease in the yield of cereals has taken place, but has, on the contrary, augmented by double and treble the amount in the districts where sugar beets are planted, and that at those very places the production of meat is steadily increasing. The growth of sugar beets requires that the soil be tilled to a greater depth, thus adding to the thrift also of other plants to be cultivated later on the same soil. Besides, the remnants or waste left in the manufacture of beet sugar furnishes not only an excellent food for cattle, but also a fertilizing stuff, dispensing to a considerable extent with the use of artificial manure. But the profit is also considerable which this industry affords people who work in the sugar manufactories, as they get employment throughout the whole year, during the spring and summer seasons, in the growing and cultivation of the beets, and during the fall and winter in the manufactories.

Exhibit C is a statement showing the beet-sugar manufacture during the year ended August 31, 1881:

EXHIBIT C.—*Table showing the results of the beet sugar manufactured during the year from September* 1, 1880, *to August* 31, 1881.

[Quantities in 100 kilograms.]

States.	Factories in operation.	Beets worked.		
		Produced.	Purchased.	Total.
I. Prussia	256	14, 013, 154	11, 662, 010	25, 675, 164
II. Bavaria	2	71, 650	72, 439	144, 089
III. Wurtemberg	5	194, 505	256, 944	451, 449
IV. Baden	1	62, 928	78, 862	141, 790
V. Mecklenburg	1	34, 087	130, 007	164, 094
VI. Thuringian States	4	272, 730	170, 000	442, 730
VII. Brunswick	30	2, 426, 957	835, 272	3, 262, 229
VIII. Anhalt	32	1, 685, 809	1, 086, 469	2, 772, 278
IX. Luxemburg	2	29, 000	54, 575	83, 575
Total	333	18, 790, 820	14, 346, 578	33, 137, 398
Equal to cwt.	....	41, 339, 804	31, 562, 471	72, 902, 275

EXHIBIT C.—*Table showing the results of the beet sugar manufactured, etc.*—Continued.

States.	Evaporated crystallizable juice.	Beets still to be worked.	Total production of beets.	In the preceding year.	
				Factories.	Quantity worked.
I. Prussia	3,112,939	22,029,712	47,704,876	251	37,407,899
II. Bavaria	18,574	104,787	218,876	2	206,600
III. Wurtemberg	49,975	365,040	816,489	5	868,663
IV. Baden	19,520	240,000	381,790	1	245,664
V. Mecklenburg	21,070	150,906	315,000	1	236,559
VI. Thuringian States	61,259	252,500	695,230	4	672,434
VII. Brunswick	371,555	2,201,631	5,463,860	30	4,572,613
VIII. Anhalt	318,469	2,440,318	5,212,596	32	3,763,894
IX. Luxemburg	10,356	32,000	115,575	2	78,388
Total	3,983,778	27,816,894	60,954,292	328	48,052,615
Equal to cwt	8,764,177	61,197,166	134,099,442	....	105,715,753

Starch sugar was produced in the fiscal year ended March 31, 1881, by forty-five factories (against forty-four in the preceding year), converting 1,000,740 cwt. of wet starch and 25,198 cwt. of dry starch into 233,015 cwt. of solid starch sugar, 355,784 cwt. of starch-sugar sirup, and 16,924 cwt. of coloring for brandy, etc.

M. S. BREWER,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Berlin, November 12, 1881.

GERMANY—1883.

REPORT BY CONSUL KIEFER, OF STETTIN.

EXPORTS OF BEET SUGAR TO THE UNITED STATES.

I have the honor to report to you the establishment of a new beet-root sugar factory near Stettin, to be called Zuckerfabrik Schenne. Considering the importance this industry already has obtained (existing only since the beginning of this century), the constant and rapid increase of it from year to year, the material part it takes in augmenting national wealth, the new and remunerative employment it gives to thousands of men, particularly during winter time; the large profits it yields, as well to the farmer as to the manufacturer; the considerable amount of taxes it pays to the Government, and last but not least, the beginning of export of raw sugar to the United States—the home of the sugar cane—it may well be worth while to pay attention to a new enterprise of this kind in our close neighborhood.

THE INDUSTRY IN POMERANIA.

It is only a short time since the beet root has been introduced into Pomerania, the principal districts in Germany for its cultivation nearly exclusively having been the Prussian province of Saxony (Magdeburg

being especially known for it), Silesia, Hanover, Braunschweig, and Anhalt, these producing together 78 per cent. of the total production of crude sugar.

During the last 12 years some factories in Pomerania have been erected, which are paying a very liberal dividend—from 60 to 100 per cent.

ESTABLISHMENT OF A FACTORY IN STETTIN.

Towards the close of last year the project of establishing such a factory near Stettin was discussed; and the preliminaries all having been fulfilled, the organization of the company, Zuckerfabrik Schenne, took place January 28 of this year in this city.

According to the statutes, the capital stock will consist of 900 shares of 500 marks each, making a total of 450,000 marks, with power given to the board of directors to increase the capital to 750,000 marks eventually.

The shares are either beet-root shares, so called, or cash shares. There are 614 of the first kind, representing 107,000 marks, and 286 of the other class, representing 143,000 marks, all the shares having been subscribed for, and 10 per cent., as first payment, has already been paid in; only 10 per cent. more besides the first payment of 10 per cent. will be asked in cash of the shares, the so-called beet-root shares; the balance due of 80 per cent. will be compensated by a deduction of 20 pfennigs per centner of the roots, to be delivered. By this very ingenious plan, the company, as will be seen at once, secures at the same time capital and raw material at a reasonable price for running the factory.

The business of the company is managed by a board of directors and a board of trustees and the general meeting of the shareholders.

Each director must hold at least 30,000 marks in shares, which he has to deposit with the trustees as surety.

The total expenses for putting in running order are estimated at 797,937 marks, equalized by an income of 750,000 marks on shares and a mortgage to be given for 200,000 marks, leaving 152,063 marks for carrying on the business.

It seems to me that the whole plan has been well considered, is based on sound principles, and is resting upon a very solid foundation.

THE BEET-ROOT INDUSTRY OF THE EMPIRE.

In order to show the importance of this industry to our farmers and capitalists more clearly and conclusively, I inclose a report concerning the manufacture and taxation of beet sugar in Pomerania and the states belonging to the German customs for the year from August 1, 1882, to July 31, 1883, as also a calculation for 1883-'84, published by the Imperial Statistical Bureau, and reprinted in the New Stettiner Zeitung of January 26, 1884.

In perusing this report, of which the following is a synopsis, it appears that the possibility to export German sugar was shown first in the year 1860; that in consequence thereof for favoring and promoting it, the German Government refunded the taxes paid on sugar manufactured when exported, and as the tax was levied by an assessment on each centner of beets used and the drawback calculated according to the weight of sugar to be exported, it happened that gradually, in an indirect way, a premium was paid for sugar to be exported, viz: It was agreed and taken for granted that 12.5 centners of beet roots were needed for 1 centner of crude sugar; the centner of beet roots paid 80 pfennigs tax, and 9.40 pfennigs were returned for crude sugar to be exported; by improved methods of manufacture and better cultivation of the beet root itself, during the last 12 years only 11.39, and even in the last 2 years only 10.46 and 10.47 centners respectively of beets were needed for 1 centner of crude sugar, and so there was paid back on each centner of crude sugar a tax on 1.10 to 2.04 centners of beet roots which never had been paid for, being in fact equal to a premium paid on export. The consequence was that the manufacturers found it even more profitable to send their products abroad, and in 1881 we find from this consular district alone an export of crude sugar to the United States for $12,336; in 1882, for $127,818; and in 1883, for $78,746.81, which is expected to be increased during the next years.

In order to correct this state of things a commission on sugar tax was appointed early in 1883, which is in session yet, and reduced as a temporary measure the drawback 40 pfenning on each centner of sugar for 2 years.

During the time it is hoped the commission will have finished its labors and will have reached a final result.

The tax on beet-root sugar amounted in 1871–'72 to 36,014,691 marks; duty on imported sugar, 12,498,225; drawback on exported sugar, 3,875,916; net income, 44,637,000; in 1882–'83 beet-root tax, 139,954,448; import duty, 1,730,108; drawback paid, 73,507,595; total net income, 68,176,961 marks. To those taxes to be refunded must be added those that have not been actually paid out yet, being due only after 6 months, leaving in fact only a net income for 1882–'83 of 51,643,686 marks or 1 to 13 marks per head against 1 to 15 in 1871–'72.

The development of this industry in Pomerania during the last 12 years shows itself best by comparing the figures of 1871–'72 with those of 1882–'83.

Years.	Roots consumed.	Crude sugar manufactured.
	100 *kilos*.	100 *kilos*.
1871–'72	378,228	32,108
1882–'83	841,245	72,209

In addition has to be mentioned the Provincial Sugar Manufactory's refining establishment which increased the refining of raw beet-root sugar since 12 years continually and steadily from 105,203 double centners in 1871–'72 to 165,872 double centners in 1882–'83 without using any sugar-cane or colonial sugar during the whole time.

The total result of the fiscal year 1882–'83 shows an extraordinary increase of production compared with the last year's, caused partly by the establishment of new factories and the enlarging of those already existing, partly by cultivation of the beet root on a larger area, and principally by the unusually rich harvest of those roots.

There were 358 factories in operation, an increase of 15 compared with the preceding year, which produced 8,351,646 double centners of crude sugar against 5,997,222 the preceding year, and paid 139,954,448 marks taxes against 100,351,163 marks in 1881–'82. For the fiscal year 1883–'84 there will be in operation 373 factories, another increase of 15 over 1882–'83.

The revolution which has taken place since 12 years in the German sugar industry becomes most apparent by comparing the principal dates of 1871–'72 with those of 1882–'83.

Quantity of roots raised, from 22,509,182 and 87,471,537 100-kilograms.

Quantity of crude sugar produced, 1,864,419 and 8,351,646 100-kilograms.

Quantity of roots needed for producing 1 kilograms crude sugar decreased from 12.07 kilograms to 10.47 kilograms.

The import of all kinds of sugar tumbled down to 66,012 from 496,332 (100 kilos); the export increased from 142,757 100-kilograms to 4,725,514 100-kilograms, and the home consumption from 5.5 to 8.1 kilograms for every single inhabitant.

THE BEET-ROOT INDUSTRY IN THE UNITED STATES.

If I look at these astonishing results I can not help thinking that in the cultivation of this root a new and large field of enterprise and prosperity would be given to our American people, and the object of this dispatch is to call the attention of those whom it may concern to this very important matter.

Climate and soil in many States, as for instance, in Michigan, Wisconsin, Iowa, Minnesota, are particularly fitted for the culture of sugar beet, and 100,000 acres lying idle now, if planted with it would yield a rich harvest; thousands of men would get work in the factories needed for gaining the sweet juice, and for manufacturing the sugar; the genius of the American people would contrive without doubt in a short time new machines and processes to make this wonderful industry even more profitable than it is in Germany; the time will come when the beet root will be for the North what the sugar-cane is for the South, and sugar factories replace within the Northern States the cr

ton mills now springing up in the South, and the wealth of the nation will be increased materially, not only by adding a new industry to the country, but also by saving hundreds of thousands of dollars now annually sent abroad.

HERMANN KIEFER,
Consul.

UNITED STATES CONSULATE,
Stettin, February 2, 1884.

GERMANY—1884.

REPORT BY CONSUL-GENERAL VOGELER, OF FRANKFORT.

The sugar industry enjoys the special care and protection of the German Government. In my former reports I have already mentioned the fact that the climate of Germany is thought to be specially adapted to the culture of the sugar beet, being sufficiently temperate and moist to insure, if not always an abundant, at least a never-failing crop. The cheapness of labor, moreover, makes the cultivation of the sugar beet profitable to the farmer so long as he can secure anything above 1 mark (24 cents) for 1 cwt. of beets. The Government, therefore, in order to stimulate this branch of agriculture and the industry connected therewith, not only refunds to the exporter of raw sugar the amount of tax paid, but something beyond this; in other words, it puts a premium on the exportation of raw sugar. This result is brought about in the following manner:

The Government assumes, I will say, that it requires 11 cwt. of beets to produce 1 cwt. of sugar. At this assumed rate, which the Government at the time the rate was fixed knew to be a liberal one, the tax is levied. By improved methods and machinery, however, the manufacturer is now enabled to gain 1 cwt. of sugar from about 9 cwt. of beets, and being refunded in case of exportation at the rate mentioned above, he is actually paid a premium on the sugar exported. This premium being paid out of the general fund obtained by taxing the beets consumed, it follows that as the exports increase the revenues derived from the sugar-beet tax must decrease. This, indeed, is the actual fact. But now here is the dilemma in which Government finds itself at the present moment: The unusual protection afforded to the sugar industry has so unnaturally stimulated that industry as to cause factories to spring up like mushrooms all over Germany. Most of these factories are large establishments, built at a cost of from $50,000 to $300,000, employing expensive machinery and a great force of chemists, engineers, office men, and laborers. In the fall of 1881 there were in operation 338 of such establishments; in the fall of 1882, 352; 1883, 364, and 1884, 390.

It is estimated that the number of factories now completed and soon to be completed amounts to nearly 500. Besides, the capacity of many of the factories which were in operation during the last 3 years has

been greatly increased. The dividends paid up to the year 1883 in many cases reached 40 per cent. per annum, while 15 to 25 per cent. was not considered an unusual result. Under such circumstances overproduction and a consequent collapse were inevitable. It has come within the last year, and the stagnation is universal. The Government hesitates to remove the stimulus referred to, fearing still further to depress the market, and yet without a change of the law the present condition of things will only be continued. The effect of this overproduction has been startling, and the end is not yet. Raw sugar has declined in price at the following rate, viz:

Date.	Cost of 100 pounds of raw sugar.
October, 1881	$6.84
October, 1882	6.65
October, 1883	6.25
April, 1884	5.47
July, 1884	5.14
October, 1884	4.42

Most of the factories had hitherto paid 1.25 to 1.30 marks per cwt. of beets; now those which are believed to be in the best condition pay about 75 pfennigs (18 cents) per cwt., while most of them offer only 60 pfennigs (15 cents) per cwt.; some, of course, have closed up altogether. This decline in the price paid for beets again is a hardship to the farmer, the greatness of which will become apparent when it is considered that the amount of sugar beets consumed during the year ended August, 1883, amounted to more than 193,000,000 cwt., and that the amount produced this year can not fall much below 250,000,000 cwt.

The decline of this great industry, together with the low prices of grain, have had a very depressing influence on trade generally, and it is therefore safe to say that the condition of Germany as to trade and commerce is at the present moment anything but encouraging.

FERDINAND VOGELER,
Consul-General.

UNITED STATES CONSULATE GENERAL,
Frankfort, January 31, 1885.

GERMANY—1885.

REPORT VICE-CONSUL DITTMAR, OF STETTIN.

The duty on beet roots raised in this country shows a revenue in 1885 as follows:

Items.	1885.	1884.
	Marks.	*Marks.*
Revenue	160,581,112	157,031,971
Less drawback	125,949,562	109,704,580
Net	34,631,550	47,327,391

During the season—from the fall of 1885 to the end of February, 1886—duty was paid for 7,063,828 tons, of 1,000 kilograms, of beet roots, against 9,961,966 tons during the same time in 1884–'85.

The smaller crop of beet roots during the last campaign proves a pretty large decrease in their cultivation, caused by the low prices of sugar, which in their turn pressed upon those of the beet roots to such an extent that growing them did not pay the farmer any longer.

On the other hand, there is no doubt the improvement in the way of extracting sugar from the molasses by the "strontionit" process will have increased the percentage of sugar extracted from the beet roots. The export of beet-root raw sugar from the whole of Germany in the year 1885 amounted to 529,547 tons, against 738,629 tons, of 1,000 kilograms, in 1884, of which Stettin exported by sea, in 1885, 45,069 tons, value 45,000,000 marks, of raw sugars of at least 88 per cent. polarization, against 27,742 tons in 1884, and 18,690 tons, value 10,000,000 marks, of refined sugars, against 22,368 tons, in 1884, of which quantities 3,493 tons of raw sugars were sent to the United States in 1885, against 3,029 tons in 1884.

The abundant crop of beet-root in 1884 influenced the prices of sugar still in 1885, and they did not look up before a considerable decrease of its cultivation in 1885 was evident. The rather high prices quoted in May and June were but nominal, as hardly any business was done at that time, the prices of refined sugars not looking up proportionately, and but very small quantities being bought for exportation. For 50 kilograms of refined sugar of 96 per cent. polarization 20.60 marks were paid here in January, 22 marks in February, 23 marks in April, 26.60 to 27 marks in May and June, 25.80 marks in July and August, 25 marks in September, 24 marks in October and November, and 25 marks in December.

During the whole year the business in refined sugars was languid, and prices were low in proportion to those paid for raw sugars. The refined sugars extracted by the "Strontionit" process from molasses proved a strong competitor to the products of the refineries, and most probably there will be no fair balance in prices before, by the increase of molasses refineries, the price of molasses has been raised to a right proportion with those of the raw sugars. Twenty-four thousand four hundred and eighty-two tons (at 1,000 kilograms to the ton) of molasses, value 2,500,000 marks, were exported from here by sea, the greater part of which was forwarded to France, and besides which were 8,460 tons of potato sugar, potato sirup, starch sugar, starch sirup, and glucose, value 1,700,000 marks.

JULIUS DITTMAR,
Vice-Consul.

UNITED STATES CONSULATE,
Stettin, September 25, 1886.

GERMANY—1886.

REPORT OF CONSUL-GENERAL RAINE, OF BERLIN.

By an act approved June 1, 1886, relating to sugar taxation, a new classification of sugar and a new method of collecting tax on beet sugar (equaling a reduction of export bounties) was introduced.

Section 1 provides that beet-sugar tax of raw beets for manufacturing them into sugar shall be collected at a rate of 1.70 marks (40 cents) per 100 kilograms.

Section 2 provides that for sugar either exported or warehoused in bonded warehouses or private transit storehouses, provided that such quantity warehoused is not less than 500 kilograms, a bounty shall be granted at the following rates per 100 kilograms:

Kind of sugar upon which bounty is paid.	Amount.	Equivalent in United States money.
	Marks.	
(*a*) For raw sugar of at least 90 per cent. polarization and for refined sugar of at least 90, but not exceeding 98 per cent. polarization:		
(1) From August 1, 1886, to September 30, 1887	18.00	$4.28
(2) From October 1, 1887	17.25	4.16
(*b*) For candy and for sugar in white, full, hard loaves, lumps, tablets, cubes, &c., of at least 99½ per cent. polarization:		
(1) For the former period	22.20	5.28
(2) For the latter period	21.50	5.11
(*c*) All other hard sugar, not otherwise provided for, as well as for all white dry sugar (containing no more than 1 per cent. water) in crystals, also pulverized, &c., of at least 98 per cent. polarization:		
(1) For the former period	20.80	4.95
(2) For the latter period	20.15	4.80

Section 3 gives owners of beet-sugar works—for the payment of the tax due on manufactured beets, upon security—a credit for a term (as a rule, to be prescribed) not exceeding 6 months.

This legislative measure, especially dictated by the fact that the revenues from sugar showed a very palpable deficiency, appears rather late, and, as is claimed, should have been resorted to when this industry was in a flourishing state.

Beet-sugar production in the German Zollverein, years 1880–'81 to 1884–'85.

[Ton=22 cwt. Pound=½ kilogram. 100 kilograms=2.2 cwt.]

Year.	Factories in operation.	Factories obtaining juice by— Diffusion.	Factories obtaining juice by— Pressing, centrifugal filter maceration.	Beets worked.	Produced by the factories.		Quantities obtained. Filling mass.	Quantities obtained. Raw-sugar products of all kinds.	Quantities obtained. Molasses.
				Tons.	*Tons.*	*On acres.*	*Tons.*	*Tons.*	*Tons.*
1880–'81	333	309	24	6,322,203	3,871,679	296,077	739,336	555,915	164,984
1881–'82	343	324	19	6,271,948	3,431,754	303,140	774,004	599,722	150,813
1882–'83	358	343	5	8,747,154	4,448,632	323,135	1,097,508	835,165	196,305
1883–'84	376	368	8	8,918,130	4,205,064	352,107	1,216,879	940,109	207,978
1884–'85	408	402	6	10,402,688	4,936,246	370,690	1,448,619	1,123,030	259,700

Beet-sugar production in the German Zollverein, years 1880–81 to 1884–'85—Continued.

Year.	Obtained from 100 kilograms of taxed beets.			Obtained from 100 kilograms.		Quantities of beets required to obtain 1 kilogram (=2.2 pounds) of raw sugar.
	Filling-mass.	From the filling-mass.		Raw sugar.	Molasses.	
		Raw sugar.	Molasses.			
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1880–'81	25.71	19.85	5.72	165.41	49.10	25.01
1881–'82	27.14	21.08	5.23	170.45	42.85	22.01
1882–'83	27.61	21.01	4.92	167.42	39.35	23.03
1883–'84	27.30	21.08	4.66	154.50	34.18	18.98
1884–'85	30.64	23.78	5.50	170.54	39.44	20.37

FRED. RAINE,
Consul-General.

UNITED STATES CONSULATE,
Berlin, January 10, 1887.

GERMANY—1885.

REPORT BY COMMERCIAL AGENT SMITH, OF MAYENCE.

In various commodities attempts were made during the year to keep prices up by means of combinations and by a lessening of production, and notably was this the case with respect to sugar, which experienced a marked benefit therefrom. Hops, copper, silver, cotton, fats, and quinine were marked by decided declines. Raw silk has been very low in price, lower almost than ever before, but in the latter part of the year, after a long period of stagnation, an improvement in price took place.

While there was no brilliant improvement in the sugar market, business in sugar has been more favorable than in 1884, when there was a crisis in the industry. A limitation of production in this article has, of course, had a somewhat unfavorable effect upon the railroads engaged in the transportation of beets, sugar, and coal, and diminished their receipts. The imperial bureau of statistics at Berlin gives the following as a review of the results of the sugar "kampagne," as it is termed, of 1885–'86. A kampagne is the period from August to August, from one crop to another. According thereto, there were in operation up to December 1, 1885, some 399 sugar factories, which, up to that date, had used 50,905,541 double centners* of roots. From this quantity of roots, that gave a product of 7,134,920 double centners, 28,676.906 double centners were grown by the manufacturers themselves, and 22,228,635 double centners were purchased. It is conjectured that this kampagne

*220.10 pounds avoirdupois.

19,821,623 double centners of roots remain to be worked up, which would make a total quantity of 70,727,164 for the entire kampagne, against 104,026,883 double centners for the kampagne of 1884-'85, or 32 per cent. less. This, however, is only a preliminary estimate, which can be a good deal changed before the end of the kampagne.

The industry being now on a somewhat healthier basis than it has been for some time, the Imperial Government judges that the opportunity is a fitting one for a revision and reform of the tax and drawback on sugar, which has long been demanded. Beet sugar is now subjected to taxation, as far as I understand it, in the following way: Under a law enacted in 1869 a tax of 80 pfennigs up to recently has been imposed upon each centner of beet roots to be converted into sugar by the sugar manufacturers, and when the crude sugar was exported a drawback of 9.40 pfennigs was returned, based upon the calculation that 12.5 centners of beet roots were required to produce 1 centner of crude sugar; but as improved methods of obtaining the sugar were introduced, by which the beets were made to render greater returns, about 10½ centners of roots only being requisite to yield a centner of raw sugar, the Government in allowing a drawback of 9 marks 40 pfennigs paid on each centner of crude sugar sent out of the Empire, a presumed tax on 1 to 2 centners of beets, which had never really been paid, thus paying, as it were, a premium on export. It is now proposed to remedy this state of things to a certain extent by the following measure, which has been submitted to the Reichstag at its present session, but which has not been acted upon. The law of June 26, 1869, is to be replaced on August 1, 1886, by the following provisions: From August 1, 1886, to July 31, 1887, a tax of 1.70 marks on each double centner (85 pfennigs per centner) of raw beets to be levied, and from August 1, 1887, onward 1.80 marks per double centner. On exported raw sugars of at least 90 per cent. polarization the following drawbacks are to be allowed:

(*a*) On refined sugar of not more than 98 per cent., from August 1, 1886, to September 30, 1887, a drawback of 18 marks for each double centner when the quantity amounts to at least 5 double centners; from October 1, 1887, onward 18 marks 20 pfennigs on each double centner.

(*b*) On candies and on sugar in white, full, hard blocks, cakes, or sticks, or made small in the presence of the officials, for the time from August 1, 1886, to October 31, 1887, 22.40 marks.

(*c*) For all other hard sugars, as well as for all white dry sugar (not containing more than 1 per cent. of water) in crystal, crumbled, or powdered form, of at least 98 per cent. polarization: (I) for the time from August 1, 1886, to October 31, 1887, a drawback of 20 marks 80 pfennigs; (II) for the time from November 1, 1887, onwards, 21 marks.

It is estimated by the Government that the number of double centners of beets annually used for making sugar will be 90,000,000, upon which a tax of 1.80 marks is to be levied, which would give a total tax

of 162,000,000 marks ($38,556,000). From this quantity of roots it is considered that 8,571,429 double centners of raw sugar, with a polarization of 93.75 per cent. will be obtained.

The domestic consumption is put at 3,500,000 double centners. There thus remains 5,071,429 double centners for exportation, which, with a drawback of 18.20 marks, will make a sum amounting to 82,300,000.80 ($19,587,000) to be deducted from the entire tax, thus leaving an income accruing to the Government of 69,699,992.20 marks ($16,588,598.14); after deducting the 4 per cent. administration costs of 6,480,000 marks, 68,219,992.20 marks would pass into the Imperial treasury; but the cultivation of the beet is constantly increasing, and in proportion as the quantity exported is greater in ratio to the amount consumed in the Empire will the receipts of the Government be less.

J. H. SMITH,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Mayence, January 8, 1886.

GERMANY—1885.

REPORT BY CONSUL-GENERAL MUELLER, OF FRANKFORT-ON-THE-MAIN.

That the extent of the sugar industry has, like many other industries, reached its limits, will appear from some figures here given. Within the last six years the number of sugar factories went up from 328 in 1879–'80 to about 408 in 1885, and, as will appear from the inclosed Exhibit O, the quantity of sugar increased from 409,415 tons in 1879–'80 to 940,109 tons in 1883–'84.

The decline of sugar prices is explained by this enormous increase of production.

While on an average raw sugar in 1883 was still quoted at 57.19 marks per 100 kilograms, it sold in:

Date.	Per 100 kilograms.	Date.	Per 100 kilograms.
	Marks.		*Marks.*
January, 1884	54.00	July, 1884	47.10
February, 1884	53.56	August, 1884	46.03
March, 1884	52.52	September, 1884	42.00
April, 1884	50.07	October, 1884	37.40
May, 1884	48.76	November, 1884	38.10
June, 1884	49.07	December, 1884	35.10

The steady tendency towards a decline of prices induced large manufacturers of Madgeburg and neighboring places to form a "ring" for the purpose of fictitiously determining the extent of production and the price of sugar. It seems that owing to this rather compulsory measure sugar was quoted in August, 1885, at 47.80. It is doubted, however, whether they will be able to force prices of sugar, particularly in view

of the fact that their working capital, for the present at least, does not exceed 1,000,000 marks.

The German Government levies on unmanufactured beets a tax of 1.60 marks per 100 kilograms, while it pays a bounty on beet sugar exported:

	Marks.
(*a*) On raw sugar of at least 88 per cent polarization	18.80
(*b*) For candies and for sugar in full white hard loaves, of about 12.5 kilograms net weight, or if reduced to small pieces in the presence of the custom officers, per 100 kilograms, net weight	2.22
(*c*) For all other kinds of hard sugar, as well as for all white dry sugar of at least 98 per cent polarization	20.80

The present system of taxation and bounties is, however, much objected to, and a bill is to be submitted to the Reichstag to regulate the matter on a different basis.

It will appear from the following exhibit that in the fiscal year 1883–'84 the net proceeds from all taxes and duties on sugar collected by the German Zollverein amounted to $11,374,000, taxes collected on unmanufactured beets amounted to $33,960,000, and duties to $330,000; total, $34,293,000; bounties and drawbacks, $22,919,000; leaving net revenue, $11,374,000.

Beet-sugar production in the German Zollverein.

[Ton = 22 cwt. Pound = ½ kilogram.]

Year.	Factories in operation.	Factories which obtained the juice by— Diffusion.	Pressing, centrifugal filter, maceration.	Beets worked.	Beets produced by the factories.		Quantities obtained. Filling mass.	Raw-sugar products of all kinds.	Molasses.
				Tons.	*Tons.*	*On acres.*	*Tons.*	*Tons.*	*Tons.*
1879–'80	328	291	37	4, 805, 262	2, 850, 586	282, 507	554, 409	409, 415	131, 371
1880–'81	333	309	24	6, 322, 203	3, 871, 679	296, 077	739, 336	555, 915	161, 984
1881–'82	343	324	19	6, 271, 948	3, 431, 754	303, 140	774, 004	599, 722	150, 813
1882–'83	358	343	5	8, 747, 154	4, 448, 632	323, 155	1, 097, 508	835, 165	196, 305
1883–'84	376	368	8	8, 918, 130	4, 205, 064	352, 107	1, 216, 879	940, 109	207, 978

Year.	From 100 kg. (=2.2 cwt.) of taxed beets there were obtained— Filling mass.	From the filling mass. Raw sugar.	Molasses.	From 100 kg. (=2.2 cwt.) were obtained— Raw sugar.	Molasses.	To obtain 1 kg. (=2.2 lbs.) raw sugar. quantities of beets were required.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1879–'80	25. 38	18. 74	6. 00	162. 47	52. 14	25. 82
1880–'81	25. 71	19. 35	5. 72	165. 41	49. 10	25. 01
1881–'82	27. 14	21. 03	5. 28	170. 45	42. 85	23. 01
1882–'83	27. 61	21. 01	4. 92	167. 42	39. 35	23. 03
1883–'84	27. 30	21. 08	4. 66	154. 50	34. 18	18. 98

JACOB MUELLER,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Frankfort, November 30, 1885.

GERMANY—1887.

REPORT BY CONSUL WAMNER, OF COLOGNE.

To raise the price of sugar beet in Germany, which had sunk so low that the producers could scarcely realize any profit whatever in raising beets, the cultivation in the year 1885 was limited in as great a degree as possible. However, in 1886 the cultivation was again increased, when it was conjectured that the stagnation in the sugar market would soon be relieved; and besides it was a settled conviction that the cultivation of beet root as compared with other crops offered a more certain and profitable return. Large transactions in "futures" were entered into at high prices, which likewise stimulated and contributed to the increased cultivation. The crop of 1886 was a middling one, but it is generally acknowledged that the beets never before yielded so much sugar. The seed was sown in April, in warm, dry weather, and the cool and rather moist temperature of May materially aided the growth, and the hot spell from July up to September was most favorable towards the formation of sugar-producing elements in the beets. Thus the crops were gathered in an excellent condition—a condition which was due in the first place to the very favorable season, and secondly to a careful selection of the seed and the manures.

The beets were sold mostly by their bulk weight, and only in exceptional cases were the prices regulated according to the percentage of sugar. Prices varied from 1.30 to 2.50 marks (generally 1.50 to 1.80 marks) per 100 kilograms, being a slight advance on the prices which obtained in the previous campaign.

The improvements made in the campaign year 1886–'87 in the technical working in the manufacture of beet sugar were mainly in the direction of simplifying the separation and purifying processes, as also in the saving of material and work. Especially the treatment of the juice with sulphuric acid found great use, and improved methods of filtration were more frequently adopted, while the use of bone coal has been almost given up. In the campaign year 1886–'87, 137 factories (against 162 in the preceding campaign) prepared from molasses sugar, of which 55 worked with the *osmose* process. But in consequence of the low price of sugar and the proportionate high cost of molasses this process has not found use by a number of the factories supplied with the required apparatus, on account of its not being sufficiently remunerative. In 1885–'86, 78 factories worked with the osmose process, 79 in 1884–'85, 115 in 1883–'84, 124 in 1882–'83, and 135 in 1881–'82; by the elutions process of making sugar from molasses, 46 factories were occupied in 1886–'87, 51 in 1884–'85, 46 in 1883–'84, 50 in 1882–'83, and 44 in 1881–'82; by the substitution process, 10 in 1886–'87, 10 in 1885–'86 and 1884–'85, 13 in 1883–'84, 8 in 1882–'83, and 4 in 1881–'82; by the precipitation process, 2 in 1886–'87, 4 in 1885–'86, 5 in 1884–'85, 4 in 1883–'84, 6 in 1882–'83, and 4 in 1881–'82; by the elimination process,

17 in 1886-'87, 16 in 1885-'86, 13 in 1884-'85, and 2 in 1882-'83; by the strontium process, 4 in 1886-'87.

According to an estimate the following quantities of molasses were worked by the different processes by the above-mentioned factories during the campaign years 1886-'87:

	Kilograms.
By the osmose process	470,962
By the elution process	850,811
By the substitution process	116,766
By the separation process	323,065
By the strontium process	64,428
Other processes	9,098
Total	1,837,130

The following table shows the number of factories in the German Empire, the different methods employed for extracting the juice, and the quantity of beets worked during the campaign years 1871-'72 to 1886-'87 inclusive:

Campaign years.	No. of factories.	No. extracting by— Diffusion.	Press process.	Other processes.	Beets worked.
					Tons.
1871-'72	311	52	216	43	225,091
1872-'73	324	63	220	41	318,155
1873-'74	337	80	214	43	352,876
1874-'75	333	113	181	39	275,674
1875-'76	332	157	137	38	416,128
1876-'77	328	197	98	33	355,063
1877-'78	329	224	81	24	409,096
1878-'79	324	258	50	16	462,874
1879-'80	328	291	28	9	480,526
1880-'81	333	309	20	4	632,220
1881-'82	343	324	16	3	627,194
1882-'83	358	343	12	3	874,715
1883-'84	376	368	6	2	891,813
1884-'85	408	402	4	2	1,040,268
1885-'86	399	395	3	1	707,031
1886-'87	401	397	3	1	830,167

The production, imports, and exports of raw sugar for the campaign years 1871-'72 to 1886-'87, inclusive, were as follows:

Campaign year.	Production.	Imports of refined and raw sugar, No. 19 and upwards.	Imports of raw sugar below No. 19.	Exports of raw sugar.
	Tons.	Tons.	Tons.	Tons.
1871-'72	18,644	1,273	3,158	566
1872-'73	26,255	1,248	975	817
1873-'74	29,101	1,614	841	1,180
1874-'75	25,641	1,410	891	288
1875-'76	35,804	1,452	245	4,589
1876-'77	28,942	770	101	4,621
1877-'78	37,800	491	116	7,120
1878-'79	42,615	390	153	10,347
1879-'80	40,941	298	167	9,516
1880-'81	55,591	226	126	22,144
1881-'82	59,972	220	150	25,393
1882-'83	83,199	210	237	39,070
1883-'84	94,010	155	187	49,117
1884-'85	112,303	126	206	55,379
1885-'86	80,810	123	262	40,407
1886-'87	98,562	146	156	48,968

SELECTION OF THE SEED.

Taking the varieties in the same order as below given, the following are the results of the experiments:

Varieties.	Density. Brix.	Per cent. of sugar.	Quotient of purity.	Product per morgen.*
East Prussian	18.8	18.86	19.35	161.64
Knauer's Mangold II	19.1	16.82	87.78	171.72
Dippe's Sugar Richest	18.8	16.57	88.16	154.08
Knauer's Mangold I	18.4	16.40	89.00	212.94
Knauer's Improved Imperial (white)	18.7	16.38	87.63	186.84
Dippe's Improved Imperial	18.5	16.24	87.63	184.13
Knauer's Improved Imperial (rose)	18.2	15.95	87.51	176.58
Kl. Wanzleben Original	17.8	15.47	86.90	195.12
Knauer's Electoral	17.2	14.99	87.75	220.68
Aumühle	17.2	14.94	87.02	238.32
Mährisch	17.2	14.89	86.86	235.08
Koenigsberg	17.2	14.88	86.48	252.72
Knauer's Imperial	17.3	14.78	85.56	247.26
Factory Seed	17.1	14.78	86.73	267.12
Knauer's	16.9	14.74	86.94	225.00
Heucke's	16.6	14.18	85.07	267.89

* Morgen = $\frac{63}{100}$ of an acre.

Grossman reports the following results of a series of experiments carried out in 1886 with different kinds of beets:

There were 16 different kinds of beets selected for the experiments, namely: East Prussian, Knauer's Mangold II, Dippe's Sugar Richest, Knauer's Mangold I, Knauer's Improved Imperial (white), Dippe's Improved Imperial, Knauer's Improved Imperial (rose), Kl. Wanzleben Original, Knauer's Electoral, Aumühle, Mährisch, Koenigsberg, Knauer's Imperial, Factory Seed, Knauer's, Heucke's Seed.

In latter years great care and attention have been given in Germany to the selection of the best beet seed. Professor Maercker, director of the agricultural experiment station at Halle, Province of Saxony, conducted in recent years a series of experiments with a variety of seed. The seed selected consisted of 26 different sorts, which were divided among 21 different experts for experiments. The following are the results obtained:

Denomination of seed.	100 lbs. beets per German morgen.*	Per cent. of sugar in beets.	Per cent. of sugar in the juice.	Quotient of purity.	100 lbs. sugar per German morgen.
A. *Sugar beet. Vilmorin race.*					
Gebr. Dippe's improved best white quality	148.8	16.28	17.86	86.2	24.24
Vilmorin blanche améliorée, original	157.7	15.59	17.05	85.5	24.19
Grosshoff (Quedlinburg), Vilmorin, second raising	177.0	14.89	16.04	81.7	26.29
Schäper (Rossla), Barbarossa, second raising	144.5	15.93	17.39	85.8	23.12
Schreiber & Son (Heringen), Vilmorin	141.4	15.39	16.91	85.1	21.83
Schlitte & Co. (Aumühle), Vilmorin, second raising	147.2	16.45	17.77	87.6	24.30
Hornung & Co. (Frankenhausen), Vilmorin, second raising	152.8	15.93	17.47	86.7	24.56
Sugar manufactory, Körbisdorf, Vilmorin, second raising	163.9	16.06	17.39	85.6	26.29

* Morgen = $\frac{63}{100}$ of an acre.

Denomination of seed.	100 lbs. beets per German morgen.*	Per cent. of sugar in beets.	Per cent. of sugar in the juice.	Quotient of purity.	100 lbs. sugar per German morgen.
B. *Sugar beet. Kl. Wanzleben race.*					
Kl. Wanzleben, original, old raising	201.6	14.74	16.00	85.8	29.78
Kl. Wanzleben, original, new raising	189.4	15.38	16.39	86.6	29.10
Dippe's improved Kl. Wanzleben, best	183.4	16.16	17.51	87.3	29.55
Grosshoff (Quedlinburg), Kl. Wanzleben	179.0	14.29	15.36	84.2	26.55
Braune (Biendorf) improved, Kl. Wanzleben	201.5	14.75	15.84	85.9	29.57
Schreiber & Son (Heringen), Kl. Wanzleben	205.3	14.89	15.96	86.0	30.86
Schlitte & Co. (Aumühle), improved, Kl. Wanzleben	184.9	15.71	17.02	86.4	29.08
Wilke (Gr. Möhringen), Altmärker, Kl. Wanzleben	209.5	14.34	16.05	84.4	30.09
Hornung & Co. (Frankenhausen), Kl. Wanzleben	166.2	15.40	16.93	86.7	25.82
Rabbethge (Einbeck), Kl. Wanzleben	183.1	15.21	16.17	85.5	27.72
Weinschenk (Lulkau), Kl. Wanzleben	196.2	14.84	15.76	86.2	29.32
C. *Vilmorin and Kl. Wanzleben. Cross.*					
Braune (Biendorf), Vilmorin and Kl. Wanzleben, cross	197.9	15.28	16.35	86.1	30.06
Strandes (Zehringen), Vilmorin and Kl. Wanzleben, cross	164.4	14.79	16.07	84.9	24.55
Bibrans (Uefingen), Vilmorin and Kl. Wanzleben, cross	174.4	13.81	14.92	83.5	24.01
D. *Various.*					
Vilmorin collet rose, original	204.2	14.74	14.60	84.4	28.03
Gebr. Mette (Quedlinburg)	198.1	14.98	16.30	86.9	29.60
Gebr. Mette (Quedlinburg), improved white imperial	185.0	14.61	15.78	84.7	27.02
Strandes (Zehringen), improved smooth leaf	193.3	14.29	15.44	83.6	27.29

* Morgen = $\frac{63}{100}$ of an acre.

The field on which the experiments were made, being a good second-class humus beet soil, with a loamy and marly subsoil, had been manured in the early part of spring with factory compost, rich in lime. A few days previous to planting the soil had been supplied with 100 pounds each of Chili saltpeter and nitrogenous phosphatic meal to the acre.

The question of manuring the soil is one that requires the greatest attention in the cultivation of the sugar beet. Careless and injudicious use of manures is more or less detrimental to the quality of the beet. In order to determine upon the quality and quantity of manures to be used it is necessary to possess a general knowledge of the physical character and chemical composition of the soil and the beets. The prejudice against the use of certain kinds of manures—such, for example, as saltpeter—seems to be unjust. But its abuse is detrimental, and therefore great care should be exercised in employing it. With reference to the question whether the percentage of sugar in the beets is determined by saltpeter manuring, the eminent Professor Wagner, of Darmstadt, makes the following observations:

If it has been formerly observed that by strong saltpeter manuring, notwithstanding that the same had been done in conjunction with phosphoric acid manuring, the amount of sugar in the beets showed a decrease of from ½ to 1 per cent. or more, with a considerable reduction in the quotient of purity, the latest experiences furnish the

satisfactory result that beet cultivators have succeeded in establishing more uniformity in the percentage of sugar in the various kinds of beets, which is not at all, or only very slightly, diminished by manuring with 200 pounds of Chile saltpeter per morgen. A great number of experiments have proved that by strong saltpeter manuring a considerable increase in the crops of beet was obtained without showing any important reduction either in the percentage of sugar or quotient of purity in the juice. But to obtain such favorable results the chief conditions to be observed are the following:

1. Cultivate excellent sugar-rich varieties of beets.
2. Procure the seed from the best and most reliable quarter.
3. Use with Chile saltpeter a sufficient quantity of phosphoric acid, in order that the ripening of the beets is not retarded.
4. Apply the saltpeter before the sowing of the seed, and do not use it as a top dressing.

The following results were obtained from a series of manurial experiments carried out under the supervision of the agricultural society on the light and dark beet soils of the province of Posen, which show the average increase per 100 pounds of beets in the crop:

	Average increase.
200 pounds superphosphate	7.8
200 pounds superphosphate and 100 pounds Chile saltpeter	27.3
200 pounds superphosphate and 200 pounds Chile saltpeter	37.6
100 pounds superphosphate and 200 pounds Chili saltpetre	28.0
200 pounds Chile saltpeter	17.2
200 pounds ammoniated superphosphate	5.3

A mere glance at the above figures will serve to illustrate the rapid growth of the beet-sugar industry in Germany during the last 15 years. In the campaign year of 1871-'72 the production of raw sugar was only 18,644 tons, while in that of 1884-'85 it reached the enormous amount of 112,303 tons, showing an increase in 12 years of about 500 per cent.

UNITED STATES CONSULATE,
Cologne, March 17, 1888.

WM. D. WAMER,
Consul.

GERMANY—1887.

REPORT OF CONSUL MILLAR, OF LEIPSIC.

BOUNTIES.

A short time ago the Leipziger Zeitung, which is an official organ of the Saxon Government, published an article on the above subject with reference to the general question of bounties and the limits within which they should be confined. As the subject is in itself one of considerable importance, and is now occupying the attention of the Imperial Government, I have thought it worth while to summarize the arguments and conclusions of the article.

The duties of the Imperial Government are defined by the writer as twofold: First, to see that an important and wealthy industry, such

as the sugar fabrication, contributes its due share towards the taxes of the country; second, to protect the industry from the ruinous effects of French and Austrian competition, which would otherwise bring disaster upon those districts of Germany which depend upon the continuance of the sugar industry for their prosperity. The mean between these two functions, however, is no longer maintained. Last year 8,500,000 cwt. of sugar were consumed, on which a tax of 9 marks per cwt., amounting to about 76,000,000 marks, was levied. But of this sum only about 33,000,000 will remain in the treasury, the surplus of 43,000,000 returning as bounty into the pockets of the exporting manufacturers and refiners, to enable them to undersell their French and Austrian competitors in foreign markets. A similar state of things exists in Austria and France, in which latter country the bounty threatens in the course of a few years to consume the entire income derived from the duty. Obviously this state of things can not continue, and the Governments of all three countries have been compelled to devote their attention to the question.

The remedy, in the view of the writer of the article, is to be found by limiting the influence of protective duties. Such duties should confine themselves to securing the home market for the native producer; they should not attempt to secure for him the control of foreign markets. An industry which desires to extend its operations beyond the frontiers of its own country must do so with its own resources and at its own risk. It can not expect support from the taxpayers of the fatherland. Such support is not only unjust to the taxpayers and to other industries; in the long run it is injurious to the favored industry itself, and an industry which can not freely encounter competition does better not to enter into the lists at all.

The article then proceeds to consider the prospects of the sugar industry after a reduction of the bounty. As respects methods of cultivation and manufacture, the sugar industry of Germany is superior to that of any other nation; and if other German industries are able, under less favorable conditions, to compete successfully with other countries, the sugar industry may reasonably be called on to do the same. An examination of statistics leads to the same conclusion. The European production of sugar last year was as follows:

Countries.	Quantity.	Countries.	Quantity.
	Cwt.		*Cwt.*
Germany	20,200,000	Belgium	1,900,000
Austria	10,500,000	Holland	1,000,000
France	10,000,000		
Russia	9,400,000	Total	53,000,000

The export from Germany in the last five years is estimated to have been as follows:

Years.	Quantity.	Years.	Quantity.
	Cwt.		*Cwt.*
1882-'83	9,400,000	1885-'86	10,000,000
1883-'84	11,900,000	1886-'87	13,000,000
1884-'85	13,500,000		

These figures show that German sugar plays a leading part in the markets of the world and that foreign countries are largely dependent on Germany for their supplies. The only competition to be feared is that of France, and even here it is to be remarked that a long time will elapse before France is in a position to raise its production from 10,000,000 to 20,000,000 cwt., and when it has done so the increased consumption in the world will probably leave France in the same position as now. There is, consequently, no reason to fear that sugar factories will work with no profit if the export bounties are withdrawn.

Two classes of bounties have to be distinguished in Germany, the bounty on raw sugar and the special export bounty on refined sugar. The manufacturer of raw sugar is generally a farmer also and cultivates large areas of ground. He pays 85 pfennigs (20¼ cents) tax per cwt. of beets and receives 9 marks ($2.14⅛) returned on the export of each cwt. of raw sugar, so that he presumably uses about 10½ cwt. of beets to produce 1 cwt. of sugar. In point of fact he only uses 8½, so that he gets about 2 marks surplus bounty on each cwt. of manufactured sugar. The refiners are a smaller and, for the state, less important class than the farmer manufacturers of raw sugar, but they receive greater benefits. The tax paid by the refiners on raw sugar (that is, the difference between the home and export prices) is, as above, 9 marks per cwt. Ten cwt. of raw sugar produce nine of refined, so that the export bounty should not exceed 10 marks. In fact it amounts to 11.10 marks ($2.64), so that the state loses 1.10 marks (26 cents) on every cwt. of refined sugar exported. This inequality is not removed by the new proposals for the reduction of the bounties, inasmuch as the tax on raw sugar is reduced to 8.63 marks and the export bounty on refined sugar to 10.75 marks. Strictly, the export bounty should be reduced to 9.58 marks, so that the new proposal would produce a loss to the state of 1.17 marks per cwt. In other words, the state will collect some 20,000,000 marks from the farming manufacturers of raw sugar to return the bulk into the pockets of the few refiners, while only a million or two will come into the treasury. This form of the proposal is no doubt due to the great political influence of the refiners; but the article concludes with the belief that the Imperial Government and the Reichstag will nevertheless view the matter more in the light of the general welfare and protect the interests of the many against those of the few.

SAM'L ROLFE MILLAR, *Consul.*

UNITED STATES CONSULATE,
Leipsic, Germany, July 21, 1887.

GERMANY—1887.

REPORT BY CONSUL-GENERAL RAINE, OF BERLIN.

Beet-sugar production in the German Zollverein, years 1881–'82 *to* 1885–'86.

[Ton, 22 cwt.; pound, one-half kilogram; 100 kilograms, 2.2 cwt.]

Year.	Factories in operation.	Factories obtaining juice by— Diffusion.	Factories obtaining juice by— Pressing, centrifugal filter-maceration.	Beets worked.	Produced by the factories.		Quantities obtained. Filling mass.	Quantities obtained. Raw sugar product of all kinds.	Quantities obtained. Molasses.
				Tons.	*Tons.*	*On acres.*	*Tons.*	*Tons.*	*Tons.*
1881–'82	343	324	19	6,271,948	3,431,754	303,140	774,004	599,722	150,813
1882–'83	358	343	5	8,747,154	4,448,632	323,155	1,097,508	835,165	196,305
1883–'84	376	368	8	8,918,130	4,205,064	352,107	1,216,879	940,109	207,978
1884–'85	408	402	6	10,402,688	4,936,246	375,193	1,448,619	1,123,030	259,700
1885–'86	399	395	4	7,070,317	4,199,047	347,173	1,025,777	808,105	180,178

Year.	Obtained from 100 kilograms of taxed beets. Filling mass.	From the filling mass. Raw sugar.	From the filling mass. Molasses.	Obtained from 100 kilograms. Raw sugar.	Obtained from 100 kilograms. Molasses.	Quantities of beets required to obtain 1 kilogram (=2.2 pounds) of raw sugar.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1881–'82	27.14	21.03	5.28	170.45	42.86	23.01
1882–'83	27.61	21.01	4.92	167.42	39.35	23.03
1883–'84	27.30	21.08	4.66	154.50	34.18	18.98
1884–'85	30.64	23.73	5.50	170.54	39.44	20.24
1885–'86	31.92	25.14	5.61	173.31	38.03	19.25

By German act of July 9, 1887, a new mode of taxation was adopted (as reported in dispatch No. 271, dated July 26, 1887), to take effect August 1, 1877. The extraordinary development of the sugar industry in recent years is striking. The average consumption per head of the population of the chief sugar-consuming countries in the periods mentioned is reported as follows:

Country.	Year.	Kilos.	Country.	Year.	Kilos.
Great Britain	1876–'80	28.07	France	1876–'79	8.50
United States	1876–'80	17.11	Switzerland	1875–'79	8.34
Denmark	1875–'79	11.70	Germany	1874–'79	6.55
Holland	1878–'79	10.80			

From 1881–'86 the consumption has rapidly increased, on an average per head of nearly 9 kilograms, while Great Britain's consumption shows one of 32 kilograms per head.

Great Britain's high average is as remarkable as Germany's low one, and it is but natural, therefore, that the former remains chief consumer of Germany's sugar. From the 1st day of January to the 30th of Octo-

ber, 1887, Germany imported in 100 kilograms (2.2 cwts.) 35,568 (against 27,624 of same period in 1886), but exported 4,413,892 100 kilograms (against 4,069,706 in same time 1886), viz:

Country.	100 kilos.	Country.	100 kilos.
Great Britain	2,574,000	United States	81,843
Netherlands	300,444	Russia	50,259
Sweden	108,104	Belgium	47,460
Switzerland	98,742		

Prices remain, notwithstanding, low. Taking the two German chief sugar-producing cities, Cologne and Magdeburg, I find the following official price quotations per 100 kilograms:

Year.	Raw sugar.		Refined sugar.	
	Cologne.	Magdeburg.	Cologne.	Magdeburg.
	Marks.	*Marks.*	*Marks.*	*Marks.*
1879	64.9	62.6	79.1	77.2
1883	62.5	59.9	76.7	74.6
1886	45.2	42.9	55.8	54.3
1887 (October)	44.23	41.88	55.50	54.02

The consumption of German sugar abroad increased from the year 1870 to 1885 by 46.12 per cent., that in Germany by 105 per cent. As to the causes of the increased exports in recent years this plus can not be explained alone by the greater wants of the international market; but the technical progress of German sugar industry must also be taken into consideration.

As the German tax on beets is intended to be a consumption tax [Export says] it is but justified that in case of exportation such tax is restored to the exporter; for it is clear that the consumer in the international market, receiving offers of sugar from all directions, will not be willing to pay a German tax. Now, actually, for the sugar exported not only the tax paid is returned, but there is also paid a bonus, which bonus assumes the character of an export bounty. This bounty has induced an enormous increase of sugar production and a rapidly augmented exportation of sugar.

In the years from 1871 to 1885 the excess of bounties paid over the beet tax amounted to 5,737,274 marks.

The results of an official international meeting held at London a short time ago to do away, if possible, entirely with all export bounties on sugar, have not yet been officially published. In principle this export bounty has been disapproved also by German beet-sugar manufacturers in a recent meeting, though these latter claim to be still dependent on it in practice.

F. RAINE,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Berlin, February 15, 1888.

GERMANY—1887.

REPORT BY COMMERCIAL AGENT SMITH, OF MAYENCE.

REFORM OF SUGAR TAX.

About as prominent a question at the last session of the Reichstag was the reform of the sugar tax. The Government for a long time has been paying a bounty, as it were, upon sugar, and an urgent demand has been made for several years past from various quarters for a revision of the tax upon sugar, so that this anomaly should cease. By a law passed in 1869 it was assumed that it took 12½ centners of beetroots to give one centner of crude sugar, and a tax was levied on this basis and a corresponding drawback allowed on exported sugar. Since then great improvements have been made in the process of manufacturing, so that but 10½ centners of roots are necessary to produce one centner of sugar instead of 12½, as formerly, but the Government continued to grant a drawback on the basis of 12½. The export drawback thus became an enormous premium to the producers, and the German sugar manufacturers have been able to supply all Europe with cheap sugar, till to protect themselves different states had to increase their duties on foreign sugar. The industry has bloomed and astonishing dividends been paid. But the large profits at last led to overproduction and a crisis in the trade, and the export bounty cost the German Government about $5,000,000. A new law has been passed this year remedying the old to some extent. Under it, from August, 1886, the tax on sugar is to be 1.75 marks (41½ cents) per 100 kilograms (220 pounds). The export drawback upon the same quantity of raw sugar of at least 90 per cent. polarization and upon refined sugar of 90 to 98 per cent. will be 18 marks ($4.28) for the first year, and afterwards 17.25 marks ($4.10). On candies and on sugar in white hard loaves, blocks and bars, the drawback is 22.20 marks ($5.28) for this year and 21.25 marks ($5.05) hereafter. On all hard sugar and on all white dry sugar in crystal, crumb, or flour form of at least 90 per cent. polarization the bounty is 20.80 marks ($4.95) to August 1887, and 20.15 marks ($4.79) thereafter.

J. H. SMITH,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Mayence, January 8, 1887.

GERMANY—1888.

REPORT BY CONSUL-GENERAL EDWARDS, OF BERLIN.

INTRODUCTORY.

I have the honor to submit herewith a report relating to the production, fabrication, taxation, and consumption of beet-root sugar in Germany, together with tables marked A, B, C, D, E, F, and G, containing

statistical information concerning the condition and progress of the beet-root sugar industry in Germany.

Attention is especially directed to the conditions, modifications, and operations of the material and consumption taxes, as described and explained in the report. The result of the operations of the taxes in question may be seen from an examination of Table A. It will be observed that under the operations of the material tax Hamburg paid nothing, but received, as a rebate on the different classes of exports, the sum of 18,421,851 marks.* The rebate allowances accorded by the federal council are fully explained in the report, and the articles directly affected specified by name.

The beets are planted on land belonging to or rented by the factories. Whenever the factory directors do not plant their own beets, they write down very exactly the rules for cultivation, direct and oversee the manuring and working of the beet fields. The factories purchase only from those who have pledged themselves to cultivate the beets in accordance with fixed regulations.

By reference to the table marked D it will be observed that during the year 1888–'89 the factories raised 53.3 per cent. and purchased 46.7 per cent. of the entire quantity of beets used. The prices, it will be seen by reference to the report, depend upon the percentage of sugar contained in the beet, and not, as formerly, upon the weight of the beet. Table D also shows the number of factories in operation from 1871–'72 to 1888–'89. It will be seen, by reference to the same table, that the press system has gradually given way to the diffusion process.

Special mention is made in the report as to improvement introduced in the factories during the year 1888–'89.

I beg to invite your attention to the inclosed clipping from the London Times of January 24, 1890, which pretends to explain the causes of the movement in the prices of sugar during the year 1888–'89.

THE REPORT.

With the beginning of the year 1888–'89 the provisions of the law of July 9, 1887, concerning the taxation of sugar, were put into operation. This law, in addition to the old material tax on the weight of beets used in the fabrication of sugar, imposed a consumption tax on the weight of sugar placed upon the home market. Before August 1, 1888, beet sugar was taxed only to the extent that the raw roots destined to the manufacture of sugar were subject to a weight duty. This duty, in the fiscal years 1886–'87 and 1887–'88, amounted to 1.70 marks on 100 kilograms of raw beets.† In the preceding years, as far back as September, 1869, it was 1.60 marks. The material tax introduced in 1888–'89 amounts to 0.80 mark per 100 kilograms, a decrease of 0.90 mark as compared with the preceding year. But there is, in addition to this, a consumption tax of 12 marks per 100 kilograms of inland beet sugar,

* 1 mark = 23.8 cents. † 1 kilogram=2,205 pounds.

that is, on all sugar which is manufactured in inland factories from beets, or products of sugar fabrication (sirup and molasses), or by further finishing processes, from such sugar (refining, etc.). This consumption tax is due so soon as the sugar passes from the revenue control, under which it has lain during the manufacturing and refining process, into the open market. Only sirup and molasses are free from this consumption tax, and even upon these the federal council is empowered to impose the consumption tax, partially or in full, when the condition of such drippings is such as to fit them for finer uses. According to section 6 of the law of July 9, 1887, all drippings which in the dry substance contain 70 per cent. or more of sugar are subject to the consumption tax of 12 marks per 100 kilograms.

The material tax for sugar which is exported beyond the customs frontier, or which is kept in bond in public or private warehouses, when the amount is at least 500 kilograms, is refunded per 100 kilograms as follows:

(*a*) For raw sugar of at least 90 per cent. fine, and for refined sugar containing less than 98 per cent., but at least 90 per cent. of sugar, 8.50 marks.

(*b*) For candies, and for sugars in white, full, hard loaves, blocks, plates, sticks, or cubes, or broken small in the presence of revenue officers; for so-called crystals, or for other white, hard, translucent sugar in crystal form, containing at least 99½ per cent. of sugar, particularly the sort known in trade as granulated; further, for other sugars of at least 99½ per cent. purity, which at any time may be thus classified by the federal council, 10.65 marks.

(*c*) For all other hard sugars, as well as for all white, dry (not containing over 1 per cent. water) sugars in crystal, crumb, or flour form, containing at least 98 per cent. sugar, so long as they do not fall under *b*, 10 marks.

The sugar lying in public or private warehouses, upon payment of the tax, may be placed upon the domestic market.

Upon the exportation of wares in whose manufacture sugar of all sorts described in *a*, *b*, and *c* has been used, or upon the storing of such wares in public or private warehouses, under official surveillance, according to the decision of the federal council, the material tax and the already paid consumption tax on the amount of sugar contained in the wares is to be refunded. The federal council has accorded this privilege to the following articles: Condensed milk, chocolate, conditor's wares (dragées, desert bonbons, marzipan, cakes, and similar baked wares, sugared southern and other fruits glazed and candied, as well as fruits preserved in sugar), alcoholic fluids containing sugar, namely, sweetened spirits (liqueurs), as well as fruit juices and brandies cooked with sugar and mixed with alcohol, and further, to fluid refined sugar and that known in trade as fruit sugar. If such goods are taken from the warehouse where they have been stored in bond, the material and consumption taxes must be paid. For the transition period from August 1

to October 1, 1888, certain lightenings of the new regulations were allowed, and particularly for such cases in which the sugar has been produced before the revenue officers before August 1, and its identity established by its having been stored in bond; or in which the revenue officers, on August 1, in the sugar factory, had made an inventory of the supplies on hand of raw sugar or unfinished wares, and had reckoned the product therefrom of finished sugar; or in which the sugar came from factories which, during the term in question, had not used beets or procured sugar or sugar drippings elsewhere, or only so far as their origin in the preceding fiscal period was beyond doubt. The modifying of the taxes in these cases consisted in this, that upon exportation, or storing in bonded warehouses, a rebate was allowed amounting on 100 kilograms of sugar, class *a*, to 17.25 marks; class *b*, to 21.50 marks; class *c* to 20.15 marks; or, upon being placed on the inland market, the consumption tax was remitted. For sugar from foreign countries (all kinds, with the exception of sirup and molasses) since August 1, 1888, the import duty has been 30 marks per 100 kilograms. Previously this rate of duty had been only for refined sugar and such raw sugars as reached the Dutch standard No. 19, while other raw sugars paid 24 marks per 100 kilograms. When foreign sugar is introduced for further manufacture in a sugar factory, the amount of the consumption tax (12 marks per 100 kilograms) can be deducted and only 18 marks per 100 kilograms collected in customs duties.

As in the second half of the year 1887–'88 the condition of sugar prices was not unfavorable, and as, consequently, the coming campaign could be looked forward to with some degree of confidence by the sugar factories, more sugar beets were planted in 1888 than in the preceding year. If, notwithstanding this, in the year 1888–'89 not more beets were used nor a much larger mass of sugar produced than 1887–'88, these facts were due to the weather of 1888.

The late winter delayed planting partially until May. The frequent rains in the months of June and July promoted, it is true, the growth of the beet; but the lack of heat was unfavorable to the development of the sugar ingredients, and the more favorable weather of August could not remedy the injury. If, therefore, the crop in quantity exceeded that of the preceding year, it fell behind in quality, the beet of 1887, according to the reports of Magdeburg officials, having been equaled by that of no previous year in the amount of sugar contained in it. Furthermore, the frosts in the early part of November did great damage, because at that time many of the factories still had a large portion of their beets in the ground. It is true that work was at once begun with the frozen beets, though—a thaw setting in at the end of November—the great supply on hand could not be used with sufficient rapidity. The juices of the thawed-out beets were to such an extent rendered impure by a slimy substance (the so-called beet gum) that they could only with difficulty, and often not at all, be filtered by

means of the presses. The cooking in vacuum was also difficult in many factories, so that some of the manufacturers gave up the attempt to use the frozen beets. Similar reports concerning the injuries from frost, which rendered a part of the beet crop useless in sugar fabrication and consequently disturbed business, were made from nearly all the North German directive districts. In general, however, the condition of the beets used was favorable, though their quality did not equal that of the preceding year. In regard to the cultivation and production of beets no important changes were introduced. As formerly, the beets were either planted on land belonging to or rented by the factories or obtained from others who had pledged themselves to cultivate the beets in accordance with fixed regulations. Whenever the factory directors do not plant their own beets they write down very exactly the rules for cultivation, direct and oversee the manuring and working of the beet fields. It is more and more becoming the custom of the factories not to pay for the beets by weight, but to take also into consideration the amount of contained sugar. The best delivery contracts fix for a certain price a certain percentage of sugar in the beet, for any thing in excess of which additional prices are paid. Often, moreover, these contracts contain the provision that, if the beets do not produce a certain percentage of sugar, they may be refused. For 100 kilograms of beets from 1.5 to 2.5 marks were paid, the usual price being from 1.8 to 2 marks.

No special technical improvements or inventions are reported as having been practically introduced during the year 1888–'89, though many of the factories were more thoroughly equipped. The improvements were chiefly in the direction of economizing in the use of steam, the strengthening and improvement of the diffusion batteries, the introduction of the process of purifying the juice with sulphuric acid, the adoption of new filter presses, etc. In some factories a new system has been tried with more or less success, by which raw sugar, by means of systematic washing, is freed from molasses and converted into white sugar fit for consumption.

The manufacture of sugar from molasses, as compared with the preceding year, showed a decline in 1888–'89, in 1887–'88 167 factories producing sugar from molasses as well as from beets, while in 1888–'89 there were only 115. Of these 45 used the Osmose process (1887–'88, 84; 1886–'87, 55; 1885–'86, 78; 1884–'85, 79; 1883–'84, 115; 1882–'83, 124; and 1881–'82, 135), and probably the use of this costly process would have been still more diminished had it not been for the rise in the prices of sugar, owing to which the price of Osmosist sugar at the end of the year was higher than that of the first product at the beginning of the campaign. The elution process is in use in 40 factories (1887–'88, 48; 1886–'87, 46; 1885–'86 and 1884–'85, 51; 1883–'84, 46; 1882–'83, 50; and 1881–'82, 44). The substitutson process was used in 5 (1887–'88, 9; 1886–'87, 1885–'86, and 1884–'85, 10; 1883–'84, 13; 1882–'83, 8; 1881–'82, 4). The settling process was used in 2 (1887–'88, 3; 1886–'87, 2; 1885

'86, 4; 1884-'85, 5; 1883-'84, 4; 1882-'83, 6; and 1881-'82, 4). The separation process was used in 20 (1887-'88, 20; 1886-'87, 17; 1885-'86, 16; 1884-'85, 13; and 1882-'83, 2). The strontian process was in use in 3 (1887-'88, 1886-'87, 1885-'86, 1884-'85, and 1883-'84, each 3). In regard to the costs of fabrication only to a limited extent were reports made, and these were calculated differently. In general, however, it appears that these expenses were somewhat larger than in the preceding year, because the beet price and, to an extent, the wages of labor were higher. In comparison with the preceding year the saving in the beet tax (0.90 mark on the 100 kilograms, see above) more or less equalized the increase in cost of production. From the beginning of the campaign until December sugar prices fell not inconsiderably, but in that month they recovered again somewhat, and remained at about the same height during the two following months. From the month of March on, however, the influence of a high-price union (sugar trust) in Magdeburg made itself felt, and prices rose very high, though in July a very great fall followed. The price rise in the spring of 1889 occasioned the unusual circumstance that most of the factories were able to dispose of their seconds for higher prices than they got for their first products.

A.—*Amount of tax on inland sugar and customs duty on foreign sugar, together with the amount of sugar products placed in the open market in the year* 1888-'89.

District.	Income from material tax.			
	Sugar material tax (beet tax.)			Material tax for sugar and wares containing sugar (taxes paid on wares taken from warehouses.)*
	Gross receipts.	Less for exported or warehoused sugar.*	Net receipts.	
	Marks.	*Marks.*	*Marks.*	*Marks.*
East Prussia	271, 028	127, 601	143, 427	....
West Prussia	2, 981, 311	5, 479, 886	—2, 498, 575	5, 822
Brandenburg	1, 263, 948	124, 412	1, 139, 536	....
Pomerania	1, 258, 418	3, 329, 910	—2, 071, 492	489, 531
Posen	3, 820, 274	1, 042, 560	2, 777, 714	....
Silesia	8, 197, 265	4, 939, 389	3, 257, 876	836, 452
Province of—				
Saxony	22, 224, 126	21, 534, 662	689, 464	2, 976, 711
Schleswig-Holstein	192, 933	1, 317, 502	—1, 124, 569	707, 797
Hanover	6, 769, 688	3, 060, 912	3, 708, 776	46, 617
Westphalia	747, 972	168, 858	579, 114	7, 173
Hessen-Nassau	529, 964	172, 181	357, 783	....
Rhineland	2, 002, 642	5, 126, 977	—3, 124, 335	771, 825
Total Prussia	50, 259, 569	46, 424, 850	3, 834, 719	5, 841, 918
Bavaria	161, 560	5, 122 442	—4, 960, 882	2, 194, 204
Saxony	565, 356	11, 659	553, 697	....
Würtemburg	454, 568	9, 516	445, 052	4, 689
Baden	175, 672	712, 764	—537, 092	206, 396
Hessen	514, 336	252, 920	261, 416	....
Mecklenburg	1, 027, 727	81, 107	946, 620	258
Thuringia	1, 086, 325	41, 535	1, 044, 790	....
Brunswick	4, 824, 736	3, 515, 353	1, 309, 383	130, 659
Anhalt	4, 099, 669	2, 958, 747	1, 140, 922	138, 701
Lübeck	....	2, 783	—2, 783	....
Bremen	....	2, 520, 526	—2, 520, 526	....
Hamburg	....	18, 421, 851	—18, 421, 851	5, 625
Total for German customs district	63, 169, 518	80, 076, 053	—16, 906, 535	8, 522, 450

* As classified in section 6 of the law of July 9, 1887.

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A.—*Amount of tax on inland sugar and customs duty on foreign sugar, etc.*—Continued.

District.	Income from consumption tax.			Receipts from customs duties on foreign sugar.	Total receipts.
	Gross receipts.	Less for exported or warehoused wares.	Net receipts.		
	Marks.	*Marks.*	*Marks.*	*Marks.*	*Marks.*
East Prussia	260, 032	....	260, 032	4, 035	407, 494
West Prussia	312, 746	....	312, 746	17, 730	—2, 162, 277
Brandenburg	712, 143	....	712, 143	29, 370	1, 881, 049
Pomerania	393, 926	....	393, 926	39, 330	—1, 148, 715
Posen	693, 995	....	693, 995	660	8, 472, 369
Silesia	7, 140, 226	....	7, 140, 226	9, 405	11, 242, 959
Province of—					
Saxony	8, 371, 303	....	8, 371, 303	35, 745	12, 073, 223
Schleswig-Holstein	1, 158, 354	....	1, 158, 354	58, 410	799, 992
Hanover	1, 020, 555	....	1, 020, 555	76, 965	4, 852, 918
Westphalia	137, 751	....	137, 751	2, 100	726, 138
Hessen-Nassau	86, 552	....	86, 552	17, 625	461, 960
Rhineland	5, 191, 583	....	5, 191, 583	104, 235	2, 943, 308
Total, Prussia	25, 479, 166	....	25, 479, 166	395, 610	35, 551, 413
Bavaria	3, 924, 682	22, 395	3, 902, 287	74, 280	1, 209, 889
Saxony	645, 213	841	644, 372	38, 355	1, 236, 424
Würtemburg	736, 921	....	736, 921	3, 075	1, 189, 737
Baden	1, 210, 311	....	1, 210, 311	105, 318	984, 933
Hessen	261, 925	....	261, 925	613, 359	1, 136, 700
Mecklenburg	732	....	732	12, 510	960, 120
Thuringia	517, 649	....	517, 649	1, 980	1, 564, 419
Oldenburg	....	....	....	795	795
Brunswick	2, 485, 930	....	2, 485, 930	15, 855	3, 941, 827
Anhalt	1, 692, 067	....	1, 692, 067	90	2, 971, 780
Lübeck	....	....	....	26, 820	24, 087
Bremen	813	....	813	33, 960	—2, 485, 758
Hamburg	69, 482	....	69, 482	57, 735	—18, 289, 009
Alsace-Lorraine	....	....	....	90, 450	90, 450
Luxemburg	....	....	....	7, 305	7, 305
Total for German customs district	37, 024, 891	23, 236	37, 001, 655	1, 477, 497	30, 095, 067

A.—*Amount of tax on inland sugar and customs duty on foreign sugar, etc.*—Continued.

District.	In the open market.			
	Inland beet sugar.		Sirup and molasses paying consumption tax.	Total.
	Paying consumption tax.	Not paying consumption tax.		
	100 kilos.	*100 kilos.*	*100 kilos.*	*100 kilos.*
East Prussia	21, 670	....	....	21, 670
West Prussia	26, 062	1, 609	....	27, 671
Brandenburg	59, 345	10, 129	....	69, 474
Pomerania	32, 816	12, 471	12	45, 299
Posen	57, 833	4, 066	....	61, 899
Silesia	595, 031	57, 701	....	652, 732
Province of—				
Saxony	697, 581	83, 861	....	781, 442
Schleswig-Holstein	96, 530	33, 976	....	130, 506
Hanover	85, 048	3, 835	....	88, 383
Westphalia	11, 510	254	25	11, 789
Hessen-Nassau	7, 213	312	....	7, 525
Rhineland	432, 389	....	249	432, 638
Total, Prussia	2, 123, 028	207, 714	286	2, 331, 028
Bavaria	327, 063	75, 314	....	402, 377
Saxony	53, 467	16, 385	302	70, 154
Würtemburg	61, 416	24, 914	....	86, 335
Baden	100, 859	40, 918	....	141, 777
Hessen	21, 827	196	....	22, 023
Mecklenburg	61	....	....	61
Thuringia	43, 138	9, 639	....	52, 777
Brunswick	207, 164	40, 284	....	247, 448
Anhalt	141, 007	39, 003	3	180, 013
Bremen	68	....	....	68
Hamburg	5, 149	298	641	6, 088
Total for German customs district	3, 084, 247	454, 670	1, 232	3, 540, 149

B.—*German sugar trade with foreign countries in* 1888–'89.

IMPORTATION.

Country.	Refined sugar, all sorts.	Raw sugar.	Sirup.	Molasses.	Glucose, starch, sugar, and sirup.
	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*
Parts of Germany not in Zollverein	961	323	2,605	....	31
Belgium	2,213	519	1	....	31
Denmark	66	111	74	....	....
France	2,315	157	618	....	11
Great Britain	3,104	11,985	13,206	....	100
Italy	2	99	....	....	....
Netherlands	9,889	5,517	587	....	14
Russia	7	52	2	....	....
Sweden	1	....	....	....	....
Switzerland	50	....	2	....	2
Asia	306	1,168	....	....	....
America	142	149	1,123	2	32
Other lands	22	84	21	....	3
Total	19,078	20,164	21,239	2	224
Total in 1887–'88	13,314	43,274	26,837	5	145

EXPORTATION.

Country.	Sugar of the rebate classes.			Sugar for which rebates are not provided.	Sirup.	Molasses.	Glucose, starch, sugar, and sirup.
	(*a.*)	(*b.*)	(*c.*)				
	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*
Parts of Germany not in Zollverein	1,035,158	475,015	74,948	154	2,899	15,532	20,239
Belgium	8,244	45,521	1,682	88	16	31,961	230
Denmark	9,426	17,703	4,693	2	53	....	1,009
France	....	102	....	63	....	180,362	11
Great Britain	2,322,199	735,253	36,782	9	2,330	747	95,870
Italy	....	57	....	....	....	2,142	4
Netherlands	483,472	59,210	1,379	60	89	....	171
Norway	....	30,004	5,368	2	154	2,356	240
Roumania	50	33,427	1,596	....	25	....	1,319
Russia	2,113	47,847	3,061	8	81	....	93
Sweden	98,942	80,828	4,252	6	84	2,919	765
Switzerland	838	95,818	....	10	297	3,171	2,340
Asia	....	331	....	4	2	....	....
America	158,845	15,917	21,068	16	108	7	4,639
Other lands	4,955	3,885	1,677	31	353	11	3,236
Total	4,124,242	1,641,518	156,506	453	6,491	239,208	130,166
Total in 1887–'88	3,447,108	1,322,128	207,438	546	3,043	572,420	259,444

C.—*Results of the beet-sugar fabrication in the German customs territory.*

Business year.	Produced from taxed beets.			
	Sugar in mass.	Salable products.		
		Raw sugar of all sorts.	Molasses.	Total.
	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*
1871–'72	2, 629, 931	1, 864, 419	638, 917	2, 503, 336
1872–'73	3, 716, 170	2, 625, 511	915, 887	3, 541, 398
1873–'74	4, 121, 142	2, 910, 417	1, 058, 181	3, 968, 598
1874–'75	3, 680, 442	2, 564, 124	976, 028	3, 540, 152
1875–'76	5, 028, 183	3, 580, 482	1, 339, 524	4, 920, 006
1876–'77	4, 055, 036	2, 894, 227	1, 111, 011	4, 005, 238
1877–'78	5, 155, 951	3, 760, 091	1, 228, 128	5, 008, 219
1878–'79	5, 761, 803	4, 261, 551	1, 336, 515	5, 598, 066
1879–'80	5, 544, 094	4, 094, 152	1, 313, 709	5, 407, 861
1880–'81	7, 393, 360	5, 559, 151	1, 649, 842	7, 208, 993
1881–'82	7, 740, 044	5, 997, 222	1, 508, 129	7, 505, 351
1882–'83	10, 935, 556	8, 319, 953	1, 963, 047	10, 283, 000
1883–'84	12, 168, 794	9, 401, 093	2, 079, 781	11, 480, 874
1884–'85	14, 486, 187	11, 230, 303	2, 596, 997	13, 827, 300
1885–'86	10, 257, 772	8, 081, 049	1, 801, 775	9, 882, 824
1886–'87	12, 459, 832	9, 856, 278	2, 158, 872	12, 015, 150
1887–'88	11, 239, 290	9, 106, 984	1, 830, 369	10, 937, 853
1888–'89	11, 653, 469	9, 445, 046	2, 011, 890	11, 456, 936

Business year.	Produced from 100 kilograms of taxed beets.				Produced from 100 kilograms of sugar in mass		Quantity of beets required for production of 100 kilograms of raw sugar.
	Sugar in mass.	Salable products.					
		Raw sugar of all sorts.	Molasses.	Total.	Raw sugar of all sorts.	Molasses.	
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	100 *kilos.*
1871–'72	11. 68	8. 28	2. 84	11. 12	70. 89	24. 29	12. 07
1872–'73	11. 68	8. 25	2. 88	11. 13	70. 65	24. 65	12. 11
1873–'74	11. 68	8. 25	3	11. 25	70. 62	25. 68	12. 12
1874–'75	13. 35	9. 30	3. 54	12. 84	69. 67	26. 52	10. 75
1875–'76	12. 08	8. 60	3. 22	11. 82	71. 21	26. 64	11. 62
1876–'77	11. 42	8. 15	3. 13	11. 28	71. 37	27. 40	12. 27
1877–'78	12. 60	9. 24	3	12. 24	73. 32	23. 82	10. 82
1878–'79	12. 45	9. 21	2. 89	12. 10	73. 96	23. 20	10. 86
1879–'80	11. 54	8. 52	2. 73	11. 25	73. 85	23. 70	11. 74
1880–'81	11. 69	8. 79	2. 61	11. 40	75. 19	22. 32	11. 37
1881–'82	12. 34	9. 56	2. 40	11. 96	77. 48	19. 48	10. 46
1882–'83	12. 50	9. 51	2. 24	11. 75	76. 08	17. 95	10. 51
1883–'84	13. 65	10. 54	2. 33	12. 87	77. 25	17. 09	9. 49
1884–'85	13 93	10. 79	2. 50	13. 29	77. 52	17. 93	9. 26
1885–'86	14. 51	11. 43	2. 55	13. 98	78. 78	17. 56	8. 75
1886–'87	15	11. 87	2. 60	14. 47	79. 10	17. 33	8. 43
1887–'88	16. 14	13. 08	2. 63	15. 71	81. 03	16. 29	7. 65
1888–'89	14. 76	11. 96	2. 55	14. 51	81. 05	17. 26	8. 36

D.—*Production and use of beets.*

[The years from 1871-'72 to 1879-'80 are reckoned from September 1 to August 31; the year 1880-'81 is reckoned from September 1 to July 31; the following years are reckoned from August 1 to July 31:]

Year.	Number of factories in operation.	Steam machines used.		Number of factories using the different processes.		
		Number.	Horse-power.	Diffusion.	Press system.	Other systems.
1871-'72	311	1,921	18,162	52	216	43
1872-'73	324	2,076	19,923	63	220	41
1873-'74	337	2,203	21,954	80	214	43
1874-'75	333	2,233	22,712	113	181	39
1875-'76	332	2,300	23,325	157	137	38
1876-'77	328	2,370	24,923	197	98	33
1877-'78	329	2,413	25,788	224	81	24
1878-'79	324	2,493	26,882	258	50	16
1879-'80	328	2,627	29,586	291	28	9
1880-'81	333	2,812	32,269	309	20	4
1881-'82	343	3,046	35,476	324	16	3
1882-'83	358	3,365	40,515	343	12	3
1883-'84	376	3,715	46,158	368	6	2
1884-'85	408	4,196	56,119	402	4	2
1885-'86	399	4,188	57,194	395	3	1
1886-'87	401	4,276	58,770	397	3	1
1887-'88	391	4,292	58,325	387	3	1
1888-'89	396	4,363	60,313	393	3	....

Year.	Beets used.			Proportion to whole amount of beets used.	
	Cultivated by factory owners.	Purchased.	Total.	Raised.	Purchased.
	100 *kilos.*	100 *kilos.*	100 *kilos.*	*Per cent.*	*Per cent.*
1871-'72	15,043,510	7,465,672	22,509,182	66.8	33.2
1872-'73	21,013,014	10,802,494	31,815,508	66	34
1873-'74	24,209,086	11,078,553	35,287,639	68.6	31.4
1874-'75	19,080,947	8,486,504	27,567,451	69.2	30.8
1875-'76	28,363,068	13,249,774	41,612,842	68.2	31.8
1876-'77	24,901,537	10,598,829	35,500,366	70.1	29.9
1877-'78	28,727,752	12,181,928	40,909,680	70.2	29.8
1878-'79	31,140,298	15,147,179	46,287,477	67.3	32.7
1879-'80	28,505,861	19,546,754	48,052,615	59.3	40.7
1880-'81	38,716,787	24,505,213	63,222,030	61.2	38.8
1881-'82	34,317,535	28,401,944	62,719,479	54.7	45.3
1882-'83	44,486,318	42,985,219	87,471,537	50.9	49.1
1883-'84	42,050,639	47,130,664	89,181,303	47.2	52.8
1884-'85	49,362,459	54,664,424	104,026,883	47.5	52.5
1885-'86	41,990,474	28,712,694	70,703,168	59.4	40.6
1886-'87	44,360,835	38,705,877	83,066,712	53.4	46.6
1887-'88	37,976,517	31,663,089	69,639,606	54.5	45.5
1888-'89	42,099,419	36,862,411	78,961,830	53.3	46.7

Year.	Amount of land from which beets raised by factory owners were harvested.	Amount produced per hectare.	Number of days' (12 hours) work consumed in process of extraction.	Amount of beets used in each day's work.
	Hectares.	100 *kilos.*		100 *kilos.*
1871-'72	73,690	204	64,451	349
1872-'73	82,590	254	87,677	363
1873-'74	88,877	272	91,254	387
1874-'75	92,655	206	70,020	394
1875-'76	96,724	293	91,675	454
1876-'77	98,725	252	70,608	503
1877-'78	104,783	274	75,320	543
1878-'79	107,679	289	75,805	610
1879-'80	113,003	252	70,909	678
1880-'81	118,431	327	82,052	771
1881-'82	121,256	283	76,325	822
1882-'83	129,262	344	94,816	923
1883-'84	140,843	299	89,956	991
1884-'85	150,077	329	97,065	1,072
1885-'86	138,869	302	65,642	1,077
1886-'87	147,782	300	72,603	1,144
1887-'88	143,853	264	59,856	1,163
1888-'89	149,411	282	67,727	1,183

E.—*German importation and exportation of sugar.*

IMPORTED.

Year.	Refined sugar.	Raw sugar.	Sirup and dutiable molasses.	Molasses for fabrication of spirits.
	100 kilos.	*100 kilos.*	*100 kilos.*	*100 kilos.*
1871-'72	127, 305	315, 832	73, 298	81, 841
1872-'73	124, 886	97, 562	69, 323	28, 716
1873-'74	161, 483	84, 148	61, 021	50, 422
1874-'75	141, 010	89, 183	56, 587	50, 335
1875-'76	145, 273	24, 526	48, 397	4, 748
1876-'77	77, 097	10, 172	53, 189	28, 600
1877-'78	49, 153	11, 674	41, 028	7, 054
1878-'79	39, 012	15, 304	38, 329	31, 827
1879-'80	29, 831	16, 764	28, 996	72, 369
1880-'81	22, 654	12, 652	33, 220	48, 516
1881-'82	22, 016	15, 049	33, 139	4, 596
1882-'83	21, 038	23, 705	35, 360	3, 611
1883-'84	15, 577	18, 763	32, 216	1, 695
1884-'85	12, 683	20, 668	33, 372	2, 816
1885-'86	12, 300	26, 203	28, 942	....
1886-'87	14, 618	15, 675	27, 166	2
1887-'88	16, 799	40, 789	26, 842	....
1888-'89	19, 078	20, 164	21, 241	....

EXPORTED.

Year.	With export rebate.			Sugar without export rebate.	Molasses and sirup.
	Raw sugar, etc.	Candy sugar, etc.	Other hard sugars, etc.		
	100 kilos.	*100 kilos.*	*100 kilos.*	*100 kilos.*	*100 kilos.*
1871-'72	56, 665	41, 763	16, 328	19, 894	8, 563
1872-'73	81, 777	51, 331	28, 472	8, 043	35, 559
1873-'74	118, 092	41, 120	26, 810	21, 182	79, 363
1874-'75	28, 838	39, 452	15, 359	16, 531	79, 829
1875-'76	458, 942	47, 125	25, 329	19, 588	84, 588
1876-'77	462, 189	73, 935	43, 428	9, 857	122, 624
1877-'78	712, 010	140, 013	63, 416	6, 764	148, 744
1878-'79	1, 034, 718	193, 561	113, 966	2, 243	174, 507
1879-'80	951, 616	252, 364	97, 052	2, 073	171, 576
1880-'81	2, 214, 420	353, 787	206, 814	1, 056	160, 782
1881-'82	2, 539, 310	399, 160	144, 130	615	211, 183
1882-'83	3, 907, 027	493, 811	242, 181	646	141, 473
1883-'84	4, 911, 701	642, 469	296, 679	597	255, 381
1884-'85	5, 537, 931	760, 154	318, 852	463	650, 618
1885-'86	4, 040, 715	666, 196	205, 689	365	561, 206
1886-'87	4, 896, 801	1, 303, 789	238, 828	414	245, 508
1887-'88	3, 447, 108	1, 322, 128	207, 438	546	575, 463
1888-'89	4, 124, 242	1, 641, 518	156, 506	453	245, 699

F.—*Average prices per* 100 *kilograms of sugar and molasses during the year ending July* 31, 1889.

[The prices for raw sugar are quoted without, for refined sugar with, the consumption tax.]

As reported by trade corporations.	August.	September.	October.	November.	December.	January.
Raw sugar:	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*
Brunswick, corn, 92 per cent. fine	47.30	48.00	34.65	34.68	36.38	36.38
Halle, corn, 92 per cent. fine	47.60	36.70	34.60	34.65	36.75	36.35
Cologne, light corn, of 96 per cent. polarization	49.80	50.40	36.92	37.15	38.16	37.84
Magdeburg, I product, corn, 92 per cent. fine	48.00	37.15	34.54	34.68	36.70	36.34
Stettin, 96 per cent. polarization	58.50	37.00	35.00	36.00	35.00	35.00
Refined sugar:						
Brunswick, ff melis (loaf)	58.75	59.00	58.63	58.00	58.75	58.63
Halle, fine (loaf)	58.50	58.50	58.20	57.80	58.50	58.00
Cologne, with small etiquettes	60.70	60.62	59.90	59.37	59.83	59.70
Madgeburg, fine (loaf)	57.90	58.00	....	56.80	57.50	57.19
Stettin, Ia loaf	62.00	62.00	61.00	63.00	63.00	62.00
Molasses:						
Brunswick, unosmosirt, 43° Bé., without tun	6.00	6.00	6.08	7.40	7.35	6.45
Halle, unosmosirt, without tun	5.80	5.80	5.80	6.20	6.05	6.25
Magdeburg, without tun for spirit fabrication	4.72	4.80	4.80	4.80	....	....

F.—*Average prices per 100 kilograms of sugar, etc.*—Continued.

As reported by trade corporations.	February.	March.	April.	May.	June.	July.
	Marks.	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*
Raw sugar:						
Brunswick, corn, 92 per cent. fine	36.70	41.05	48.63	....	....	....
Halle, corn, 92 per cent. fine	36.70	41.05	50.05	50.70	....	....
Cologne, light corn, of 96 per cent. polarization	38.72	43.15	51.60	55.17	60.95	58.38
Magdeburg, I product, corn, 92 per cent. fine	36.71	41.09	49.80	52.21	....	51.00
Stettin, 96 per cent. polarization	37.75	43.50	50.00	53.00	57.00	50.00
Refined sugar:						
Brunswick, ff melis (loaf)	58.63	61.50	69.63	74.00	74.60	75.25
Halle, fine (loaf)	58.00	61.60	70.25	74.30	76.15	76.50
Cologne, with small etiquettes	59.00	64.00	71.50	75.50	78.25	79.00
Magdeburg, fine (loaf)	56.92	61.00	69.81	....	75.41	74.58
Stettin, Ia loaf	63.50	69.00	72.00	76.00	86.00	79.00
Molasses:						
Brunswick, unosmosirt, 43° Bé., without tun	6.15	6.10	7.16	7.50	7.68	7.80
Halle, unosmosirt, without tun	6.20	6.15	7.00	7.55	7.80	....
Magdeburg, without tun for spirit fabrication	5.80	5.47	5.40	7.10	6.50	....

G.—*Consumption of sugar and amount of sugar taxation in the German customs territory.*

Year.	Production of raw sugar.	Importation of sugar, reduced to the basis of raw sugar.	Total.	Exportation of sugar, reduced to the basis of raw sugar.	Consumption of sugar.	Consumption per head of population.
	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	*Kilos.*
1871-'72	1,864,419	496,332	2,360,751	142,757	2,217,994	5.5
1872-'73	2,625,511	270,852	2,896,363	179,382	2,716,981	6.6
1873-'74	2,910,407	289,530	3,199,937	216,550	2,983,387	7.2
1874-'75	2,564,124	276,907	2,841,031	108,134	2,732,897	6.5
1875-'76	3,580,482	212,532	3,793,014	561,209	3,231,805	7.6
1876-'77	2,894,227	125,060	3,019,287	603,538	2,415,749	5.6
1877-'78	3,780,091	88,830	3,868,921	967,785	2,901,136	6.7
1878-'79	4,261,551	79,710	4,341,261	1,380,768	2,960,493	6.7
1879-'80	4,094,152	65,842	4,159,994	1,344,857	2,815,137	6.3
1880-'81	5,559,151	56,073	5,615,224	2,839,039	2,776,185	6.8
1881-'82	5,997,222	57,330	6,054,552	3,144,103	2,910,449	6.4
1882-'83	8,319,953	66,012	8,385,965	4,725,514	3,660,451	8.1
1883-'84	9,401,093	53,761	9,454,854	5,958,144	3,496,710	7.7
1884-'85	11,230,303	53,035	11,283,338	6,737,274	4,546,064	9.9
1885-'86	8,081,049	55,745	8,136,794	5,003,215	3,133,579	6.8
1886-'87	....	....	....	....	3,614,756	7.7
1887-'88	....	....	....	....	3,981,631	8.4
1888-'89	....	....	....	....	3,575,975	7.4

Year.	Taxes.					
	Taxes on beets and sugar.	Customs duty.	Total.	Tax rebates.	Net receipts.	Per head of population.
	Marks.	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*
1871-'72	36,015,000	12,498,000	48,513,000	3,322,000	45,191,000	1.12
1872-'73	50,905,000	7,127,000	58,032,000	3,226,000	54,806,000	1.33
1873-'74	56,460,000	7,779,000	64,239,000	3,593,000	60,646,000	1.46
1874-'75	44,108,000	7,218,000	51,326,000	1,651,000	49,675,000	1.18
1875-'76	66,581,000	5,672,000	72,253,000	9,004,000	63,249,000	1.49
1876-'77	56,800,000	3,354,000	60,154,000	11,618,000	48,536,000	1.13
1877-'78	65,456,000	2,369,000	67,825,000	18,009,000	49,816,000	1.15
1878-'79	74,060,000	2,112,000	76,172,000	25,627,000	50,545,000	1.15
1879-'80	76,875,000	1,730,000	78,605,000	24,399,000	54,206,000	1.22
1880-'81	101,164,000	1,481,000	102,645,000	56,496,000	46,149,000	1.12
1881-'82	100,351,000	1,518,000	101,869,000	44,992,000	56,877,000	1.25
1882-'83	139,955,000	1,730,000	141,685,000	74,398,000	67,287,000	1,47
1883-'84	142,690,000	1,401,000	144,091,000	96,302,000	47,789,000	1.04
1884-'85	166,443,000	1,379,000	167,822,000	128,453,000	39,369,000	.86
1885-'86	113,125,000	1,435,000	114,560,000	90,068,000	24,492,000	.53
1886-'87	141,213,000	1,232,000	142,445,000	108,821,000	33,624,000	.75
1887-'88	118,387,000	1,858,000	120,245,000	105,568,000	14,667,000	.31
1888-'89	108,694,000	1,477,000	110,171,000	80,076,000	30,095,000	.63

W. H. EDWARDS,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Berlin, February 9, 1890.

GERMANY—1888.

REPORT BY CONSUL WAMER, OF COLOGNE.

In the hope that the sugar crisis in the campaign of 1885–'86 would soon come to an end the area of beets planted in 1887 was not very much larger than that cultivated in the preceding year, which had been reduced as much as possible in order to avoid an overproduction. The condition of the industry in the campaign of 1886–'87 did not turn out as it had been hoped it would, and so it was again thought necessary to reduce the production in the following campaign. In 1887 the manufacturers not only reduced their area, but also made smaller contracts with the farmers. The farmers, therefore, who raise beets for sale, that is, those who are not manufacturers themselves, planted less because they were unable any longer to realize the profits which they had hoped for. The production of beets in the campaign 1884–'85 amounted in tons to 10,402,688; campaign 1885–'86 to 7,070,316; campaign 1886–'87 to 8,306,671, and campaign of 1887–'88 to 6,963,960. The prices paid for beets in the last campaign ranged from 1.50 to 2.40 marks per 100 kilograms.

The technical improvements in the campaign of 1887–'88 in beet-sugar manufacture consisted in evaporation contrivances and filtering processes. The improvement in the first instance consisted in a greater saving in the use of waste steam by making the evaporation space larger and the heating of the apparatus more than formerly with indirect steam, whereby a material saving in heating fuel is accomplished. In the purifying of the beet juice sulphurous acid has been brought more into use; also, the repeating treatment of the juice with lime and carbonic acid, with the use of the filtering presses, has proved satisfactory. A new separation process, with the addition of carbonate of magnesia, is reported to have worked with good results in the Rhineland.

In the campaign of 1887–'88, there were 167 factories that prepared sugar from molasses against 137 in the preceding campaign, of which 84 worked by the "Osmose" process. As long as the prices of sugar were low and the price of molasses proportionately so, this process went largely out of use on account of too small profits, but it has been recommenced in the last year by a large number of factories, because the corresponding prices of sugar and molasses have been more favorable. In the campaign of 1886–'87, 55 factories worked with the "Osmose" process, 3 in 1885–'86, 79 in 1884–'85, 115 in 1883–'84, 124 in 1882–'83, and 135 in 1881–'82. In 1886–'87, 48 factories worked with the "Elution" process, 9 with the "Substitution," 3 with the "Precipitation," 20 with the "Separation," 3 with the "Strontium," and 1 with the "Manoury."

The following quantities of molasses were used for being converted into sugar by the above factories in the campaign of 1886–'87:

	Tons.
Osmose process	68,954
Elution and precipitation process	88,256
Substitution process	11,754
Separation process	39,889
Strontium process	6,341
All other processes	761
Total	215,955

The prices of sugar in the last campaign were more favorable in consequence of the prospect of a reduction in the production of beets, and of a smaller supply of sugar, on hand. In September and October there was a considerable sinking in the prices, but from that time they began to rise, when in January their highest points were reached. During the remaining period of the campaign, although the movement in the prices from February to May was downward, it took an upward course in June and July. The average prices of sugar in the principal markets of Germany per 100 kilograms during the last and preceding campaigns were as follows:

Campaign.	Refined sugar.			Raw sugar.		
	Brunswick.	Cologne.	Magdeburg.	Brunswick.	Cologne.	Magdeburg.
	Marks.	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*
1887–'88	58.76	59.43	57.70	46.35	48.67	46.39
1886–'87	53.36	54.13	52.64	41.27	43.53	41.29

The annexed table of the production of beet sugar in Germany during the past 17 years shows what wonderful progress there has been made in this one industry in Germany. The number of factories in operation rose from 311 in 1871–'72 to 391 in 1887–'88, and the quantity of beets worked during the same period rose from 2,250,000 to near 7,000,000 tons. The largest quantity of beets worked during said period was in 1884–'85, which amounted to 10,500,000 tons. (See Table A.)

The exports of raw beet sugar from the German Zollverein rose from 5,666 tons in 1871–'72 to 553,793 tons in 1884–'85, which fell off to 344,710 tons in 1887–'88. The export bounties amounted in 1871–'72 to about \$922,468, and in 1887–'88 to a little over \$2,700,000. The total gross receipts of the taxes on sugar in 1871–'72, including the import duties, were \$11,546,044, and in 1887–'88, \$26,040,844. The net income, therefore, to the Government, that is, after deducting the bounty, was only a little above \$1,000,000 in 1887–'88, against \$10,625,000 in 1871–'72. The highest net income received by the Government during the 17 years was in 1882–'83, when it amounted to about \$16,000,000.

Revenues from taxes on sugar beet collected in the Zollverein of Germany.

Years.	Gross receipts from sugar tax.	Gross receipts from import duty on sugar.	Total gross receipts from all taxes and duty.	Bounties on exports.	Net receipts from taxes and duties. Total.	Net receipts from taxes and duties. Per capita.
						Cents.
1880-'81	$24,077,024	$352,470	$24,429,494	$13,458,421	$10,971,073	28½
1881-'82	23,833,576	361,297	24,244,873	10,332,189	13,912,684	31
1882-'83	33,309,158	411,765	33,720,923	17,706,644	16,014,279	35½
1883-'84	33,960,239	333,314	34,293,553	22,919,935	11,373,618	25
1884-'85	39,613,436	328,107	39,941,543	30,571,741	9,369,799	20⅛
1885-'86	26,923,766	341,455	27,265,221	21,436,075	5,829,146	12⅛
1886-'87	33,608,791	293,161	33,901,952	27,175,207	6,726,745	14¼
1887-'88	28,176,253	442,135	28,618,388	27,040,844	1,577,544	3¼

Imports and exports of sugar in the German Customs Union.

Fiscal years.	Imports. Refined and raw sugar, Dutch standard, No. 19 and upwards.	Imports. Raw sugar below No. 19.	Imports. Sirup and dutiable molasses.	Imports. Molasses for distilleries.	Exports. Raw sugar, etc. (against drawback).	Exports. Candy sugar (against drawback).	Exports. Other hard sugar, etc. (against drawback).	Exports. Sugar without drawback.	Exports. Molasses and sirup.
	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*
1871-'72	127,305	315,832	73,298	81,341	56,665	41,763	16,328	19,394	8,563
1872-'73	124,886	97,562	69,323	23,716	81,777	51,831	28,472	8,043	35,559
1873-'74	161,483	84,148	61,021	50,422	118,092	41,120	26,310	21,182	79,363
1874-'75	141,010	89,133	56,587	50,335	28,838	39,452	15,359	16,531	79,829
1875-'76	145,273	24.526	48,397	4,748	458,942	47,125	25,329	19.588	84,588
1876-'77	77,097	10,172	53,189	28,600	462,189	73,935	43,423	9,857	122,624
1877-'78	49,153	11.674	41,028	7,054	712,010	140,013	83,416	6,764	148,744
1878-'79	39,012	15,304	38,329	31,827	1,034,718	193,561	113,966	2,243	174,507
1879-'80	29,831	16,764	28,996	72,369	915,616	252,364	97,052	2,073	171,576
1880-'81	22,654	12,652	33,220	48,510	2,214,420	353,787	206,814	1,056	160,782
1881-'82	22,016	15,049	33,139	4,588	2,539,310	399,160	144,130	615	211.183
1882-'83	21,038	23,705	35,369	3,611	3,907,027	493,811	242,181	646	141,473
1883-'84	15,577	18,763	32,216	1,695	4,911,761	642,469	208,679	597	255,381
1884-'85	12,645	20,668	33,372	2,816	5,537,931	760,154	318,852	403	650,618
1885-'86	12,300	26,203	28,942	....	4,040,715	660,196	205,689	365	511,206
1886-'87	14,618	15,675	27,166	1	4,896,801	1,303,789	238,828	414	245,094
Average	63,494	49,864	43,350	25,727	1,997,051	343,377	131,552	6,861	195,094

WM. D. WAMER, *Consul.*

UNITED STATES CONSULATE,
Cologne, February 23, 1890.

GERMANY—1888.

REPORT OF COMMERCIAL AGENT SMITH, OF MAYENCE.

The beet-root crop amounted to less than in the preceding year. On the first of August of the past year the new sugar law went into effect, by which the tax upon roots was reduced from 1.70 marks (42 cents) per hundred kilograms (220 pounds) to 80 pfennigs (20 cents), and the export drawback allowed, from 17.25 marks ($4.31) a hundred kilograms of raw sugar having at least 90 per cent. of polarization to 8.50 marks

($2.12), and a new consumption tax of 12 marks ($3) a hundred kilograms introduced on sugar of all kinds consumed in the Empire. This latter tax, it is thought, will yield the Government about $12,000,000 on about 4,000,000 double centners of sugar (a double centner is 221 pounds), which is about the amount consumed in the empire. The export bounty is 8.50 marks ($2.12) on raw sugar containing at least 90 per cent. of sugar, 10 marks ($2.50) on refined sugar containing at least 90 per cent. of sugar and not more than 98 per cent., and 10.55 marks ($2.63) on sugar containing at least 99½ per cent. of sugar.

In 1868 a law was passed fixing a tax on beet roots and providing for a drawback on exported sugar. At that time it took 12½ hundred-weight of beet roots to give 1 hundred-weight of sugar, and on this basis the tax was imposed, so as to give the government 10 marks ($2.50) on each hundred-weight of sugar; and on the sugar when exported a drawback of 9.40 marks ($2.35) was allowed. This afterward turned out to be a very advantageous arrangement for the sugar-manufacturers, as improved processes of manufacture took place by which 1 hundred-weight of sugar was obtained from 9 hundred-weight of roots, and sugar was even got from molasses, which the law of 1868 did not tax at all. The sugar-manufacturers, therefore, instead of paying a tax of 10 marks ($2.50), as contemplated by law, paid only 7.80 marks ($1.95) a hundred-weight, and on exporting the sugar got a drawback of 9.40 marks ($2.35) a hundred-weight, thus receiving a nice bounty. All this was very fine for the manufacturers, but very disadvantageous to the imperial exchequer. In 1883, and again in 1886, an effort was made to regulate the matter somewhat by laws passed in those years; but the knife was not sufficiently well applied, and it became necessary to pass still another law on the subject, which went into effect on the 1st of August, 1888.

On the sugar consumed in the empire, say about 3,500,000 double centners annually, the government received a tax of about $15,000,000, to collect which cost about $1,500,000, and the actual loss to the imperial exchequer by the drawback allowed on exported sugar amounted to about $9,000,000 to $9,500,000. Thus the government got from the sugar tax in net receipts only $3,500,000 to $4,500,000. The lion's share went in indirect bounty to the manufacturers. Under the present law the manufacturers will still get an export premium of about 2½ marks per double centner, or about $4,000,000 for the whole amount annually exported.

J. H. SMITH,
Commercial Agent.

COMMERCIAL AGENCY,
Mayence, January 12, 1889.

GERMANY—1888.

REPORT BY CONSUL FALKENBACH, OF BARMEN.

Many things which were formerly counted articles of luxury have now entered into general and daily use and are reckoned as indispensable to life and comfort. This is due to the great change which has come over our habits and customs. As the relations between the different countries and people of the world have become more intimate and their means of communication speedier, competition in international trade and commerce has grown sharper and more active. A wider theoretical knowledge and a profounder technical skill have come to the assistance of labor. The products of labor have been thereby cheapened, the cost of living consequently reduced, while hand in hand with the increased consumption there has been an unprecedented increase of production. This is particularly the case with sugar.

SUGAR PRODUCTION AND CONSUMPTION.

At the beginning of the last century the supply of sugar in Europe scarcely equaled half a million meter centners.* In 1730 the import of this article to Europe was estimated at a little over a million meter centner. To-day the annual consumption of raw sugar in England alone amounts approximately to 11,000,000 meter centners. According to authentic sources, moreover, in the year 1867, the total annual production of colonial sugar (cane sugar) amounted to 14,000,000 meter centners, while at present it reaches far above 30,000,000. Of beet sugar, the annual production of which was at one time only 3,500,000 meter centners, 25,000,000 meter centners are now annually consumed. In the saccharine constituents of the native German sugar beet, cane sugar, formerly exclusively used, has found a mighty competitor.

It is from the sugar cane, *Saccharum officinarum*, that the major portion of the world's supply of sugar is obtained. The American continent, with its adjacent islands, constitutes undoubtedly the most productive source, while the Island of Cuba is the largest sugar-growing country in the world, having produced in 1849 about 220,000 meter tons; in 1859, 415,000 meter tons; in 1870, 660,000 meter tons; in 1881, 521,000 meter tons, and, in 1882, 606,000 meter tons. On the South American continent Brazil ranks first as a sugar-producing country, and, after Cuba, furnishes the largest supply of sugar cane. In the harvest of 1860–'61 Brazil exported rather more than 650,000 meter centners, and in 1876–'77 as much as 1,800,000 meter centners. Since 1879, notwithstanding various circumstances, which tended to paralyze the trade, the export of sugar from Brazil has averaged more than 2,000,000 meter centners. In the extraordinary good harvest year of 1880–'81 it rose to over 2,500,000 meter centners, and in 1881–'82, in

*A meter centner is equal to 110 pounds.

which year the sugar-cane harvest was generally unfavorable, equaled, quite unexpectedly, 2,200,000 meter centners.

The following comparative estimate shows the present average production of colonial sugar in all sugar-growing countries. Owing to unavoidable circumstances the figures are in some instances only approximate:

	Meter centners.
Cuba (production)	6,000,000
Brazil (export)	2,500,000
British West Indies (export)	1,600,000
United States of America (production)	1,500,000
French West Indies (production)	950,000
British Guiana (export)	850,000
Peru (production)	630,000
Venezuela (production)	420,000
Argentine Republic (production)	230,000
Dutch Guiana (export)	140,000
San Domingo (production)	63,000
Mexico (export)	40,000
San Salvador (export)	25,000
British Honduras (export)	25,000
Nicaragua (export)	5,000
French Guiana (production)	2,000
Total in America	15,180,000
Java (production)	2,500,000
China (production)	2,500,000
Philippine Islands (export)	2,000,000
British East Indies (export)	330,000
Siam (export)	18,000
Total in Asia	7,348,000
Hawaii (export)	300,000
Queensland (production)	210,000
New South Wales (production)	90,000
Fiji Islands (production)	10,000
Total in Australia and Polynesia	610,000
Mauritius (production)	1,350,000
Réunion (production)	320,000
Egypt (production)	430,000
Natal (export)	120,000
Mayotte (production)	40,000
Nossi Bé (production)	20,000
Total in Africa	2,280,000
Spain	380,000
Total in Europe	380,000

The total production of colonial sugar in the world amounts, therefore, to 25,689,000 metre centners. To this amount, however, must be added, first, the cane sugar produced in countries other than those

above mentioned; and secondly, the home consumption of cane sugar in places from which the export has alone been stated. The total amount of sugar produced from sugar cane may then be reckoned at considerably more than 25,000,000 metre centners; in fact, a total of 26,000,000 to 27,000,000 could not be regarded as an exaggerated estimate.

Great, however, as the importance and growth of the sugar-cane industry as shown by the above figures most undoubtedly are, the vastness of the increase in the consumption of sugar by all nations during the past 20 years is first seen when a comparison is made between the development of beet sugar and that of colonial sugar as articles of commerce.

Professor Achard, a pupil of the highly meritorious discoverer of the new method of beet-sugar manufacture, Professor Markgraf, of the Berlin University, whose death occurred in 1782, started on his farm "Cuneru," in Lower Silesia, at the turn of the past and present century, with the aid of and under the protection of Frederic William III, the then reigning king of Prussia, the first beet-sugar factory in Europe. The new industry, however, owing to various causes, did not begin to flourish until much later. France, in fact, which had in 1837 no less than 585 beet-sugar factories, producing 50,000 metre centners of beet sugar annually, was the first country in which the industry in question can be said to have struck firm root. Germany followed slowly in the wake of her neighbor. In 1837 she had only 122 beet-sugar factories in operation with an annual production of only 14,400 metre centners of sugar from 254,000 metre centners of beets.

New, and almost exclusively European, the beet sugar industry supplied the world's market in 1882–'83 with 21,455,340 metre centners of sugar; in 1883–'84 with 22,400,000 meter centners, and in 1886–'87 with approximately 23,672,000 metre centners, or scarcely 14 per cent. less than the old colonial sugar industry, which is distributed over the tropic and temperate zones of the whole earth.

At the present date the beet-sugar production amounts in metre tons, at 1,000 kilograms, to—

Countries.	1876–'77.	1881–'82.	1882–'83.	1883–'84.	1884–'85.	1885–'86.	1886–'87.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
In Germany	289,422	599,722	848,124	925,000	1,123,030	808,100	985,600
In Austria-Hungary	341,553	411,015	472,002	435,000	450,000	475,000	460,600
In France	243,182	393,269	423,194	450,000	475,000	460,000	465,000
In Russia and Poland	250,000	308,779	284,491	300,000	320,000	315,000	320,000
In Belgium	45,628	73,136	82,723	90,000	92,000	90,000	93,000
In Netherlands	16,078	20,000	25,000	30,000	35,000	32,000	35,000
In other countries	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Total production	1,195,563	1,815,921	2,145,534	2,240,000	2,505,030	2,190,100	2,369,200

These figures, however, only show the extensive development of the beet-sugar industry, and not the more important development, which must certainly be considered as the true cause of the enormous increase in the consumption of beet-sugar.

GERMAN BEET-SUGAR PRODUCTION.

This intensive development is shown in the following table, extracted from the official statistics of the German Empire on beet-sugar manufacture:

Statistics of the average production of sugar and molasses during the years 1836 *to* 1887.

During the year.	No. of factories.	Annual average amount of beets consumed. In all factories generally.	Annual average amount of beets consumed. Per factory.	Production of raw sugar (juice reduced to raw sugar).	Production of— Molasses.	Production of— Raw sugar per factory.	Beets consumed per m. c. raw sugar.	Average production of— Raw sugar.	Average production of— Molasses.
		Met. cwt.	*Met. cwt.*	*Met. cwt.*	*Met. cwt.*	*Met cwt.*	*Met. cwt*	*Per cent.*	*Per cent.*
1836–'37.	122	353, 500	2, 100	14, 100	10, 900	115, 500	18. 00	5. 50	4. 30
1840–'45.	116	2, 067, 700	17, 800	129, 900	70, 400	1, 119, 500	15. 91	6. 30	3. 38
1845–'55.	221	9, 238, 900	41, 800	701, 800	233, 700	3, 125, 500	13. 66	7. 57	2. 54
1860–'65.	253	17, 931, 800	70, 900	1, 424, 400	402, 000	5, 129, 500	12. 50	8. 00	2. 23
1870–'75.	322	29, 530, 600	91, 700	2, 512, 400	840, 800	7, 802, 500	11. 75	8. 53	2. 96
1875–'76.	332	41, 612, 800	125, 300	3, 580, 500	1, 389, 500	10, 314, 500	11. 62	8. 60	3. 22
1878–'79.	324	46, 287, 400	141, 800	4, 261, 500	1, 336, 500	13, 152, 500	10. 86	9. 21	2. 80
1880–'81.	333	63, 222, 000	184, 300	5, 559, 100	1, 649, 800	16, 694, 000	11. 37	8. 80	2. 69
1881–'82.	343	62, 719, 500	182, 900	5, 997, 200	1, 508, 100	17, 484, 600	10. 46	9. 56	2. 40
1882–'83.	358	87, 471, 500	244, 300	8, 319, 900	1, 963, 100	23, 826, 200	10. 47	9. 51	2. 24
1883–'84.	376	89, 181, 300	237, 200	9, 401, 000	2, 079, 700	25, 002, 900	10. 54	10. 54	2. 33
1884–'85.	408	104, 026, 800	254, 900	11, 230, 300	2, 596, 900	27, 532, 600	10. 79	10. 79	2. 50
1885–'86.	379	70, 703, 100	177, 200	8, 081, 400	1, 801, 700	19, 587, 600	11. 03	11. 43	2. 55
1886–'87.	401	83, 066, 700	207, 100	9, 856, 200	2, 158, 800	24, 579, 200	11. 86	11. 87	2. 60

According to these figures the quantity of beets requisite to produce one metre centner of raw sugar has declined in the German Customs Union since 1836 by 40 per cent.; in the case of the less valuable molasses by 45 per cent, while the gain in raw sugar has risen by 75 per cent. The efficiency of the individual factories in producing raw sugar has increased by 20.202 per cent., and the total production by 59.2 per cent. The superior yield of saccharine matter from the beets is attributed only in a small degree to the larger average intrinsic quantity of sugar gradually produced by rational culture in the beets consumed. It is far more the result of the scientific and technical improvements which have been introduced in the internal economy of the sugar factories.

The enterprise which the Germans have shown in their application of science and new technical processes in the manufacture of beet sugar is shown by the following facts and statistics:

In the German Empire were operated in the years—

1871–'72, in a total of 311 factories, 52 with diffusion, 259 with presses.

1875–'76, in a total of 332 factories, 157 with diffusion, 175 with presses.

1882–'83, in a total of 358 factories, 343 with diffusion, 15 with presses.

1886–'87, in a total of 401 factories, 397 with diffusion, 4 with presses.

In 1886–'87, 401 sugar factories were in operation in Germany, while a large additional number were either planned or in course of construction. No less than 147,782 hectares of land were appropriated to the cultivation of beets (1 hectare equals 2.471 acres), the average crop being 300 meter centners to the hectare. The production of raw sugar

amounted to 9,856,278 meter centners, that of molasses to 2,158,872 meter centners, or 12,015,150 meter centners of salable produce.

Germany exported in 1886–'87 : Raw sugar, 5,136,039 meter centners, valued at 188,234,829 marks; refined sugar, 1,303,789 meter centners, valued at 101,043,649 marks; sirup and molasses, 243,508 meter centners, valued at 2,725,138 marks; total beet-sugar produce export, 6,685,336 meter centners, valued at 292,003,616 marks. The value of the export in 1882 was 156,770,000 marks, and in 1881, 151,898,000 marks, so that from 1881 to 1882 an increase of 4,897,000 marks took place, and from 1881 to 1887 an increase of 140,105,616 marks. The principal portion of the beet sugar manufactured in Germany is exported to England. At the same time it is probable that a portion of the English import stated as of German origin may have come from Germany only in transit. Nevertheless the German sugar industry most undoubtedly dominates the English market. In fact Germany, with her present annual production of 9,856,200 meter centners of raw sugar, is without doubt the chief sugar-producing country in the world.

During the past few years great efforts have been made to develop the beet-sugar industry in the United States. The experiments, however, which have been made at a vast sacrifice of energy and capital, have entirely failed. This deplorable experience, so dearly purchased, is partly due to the insufficient supply of beets, inferior apparatus, and mismanagement.

The following tables, A, B, C, and D, compiled from the official statistics of the German Empire for the beet-sugar industry, give a clear and very comprehensive idea of its vast extent and profitableness.

TABLE A.—*Number, arrangements, and days' work of the sugar factories in the German Customs Union, extraction and manufacturing of raw material, during the fiscal years 1871–'72 to 1886–'87.*

Fiscal year.	No. of factories.	Run with steam engines.		Factories extracting the juice—			Amount of sugar beets consumed.		
		No.	Total horse-power.	With diffusion.	With presses.	With other operations.	Own produce.	Purchased.	Total consumption.
1	2	3	4	5	6	7	8	9	10
							100 *kilos.*	100 *kilos.*	100 *kilos.*
1871–'72	311	1,921	18,162	52	216	43	15,043,510	7,465,762	22,509,182
1872–'73	324	2,076	19,923	63	220	41	21,012,014	19,802,494	31,815,508
1873–'74	337	2,203	21,954	80	214	43	24,209,086	11,078,553	35,287,637
1874–'75	333	2,233	22,712	113	181	39	19,080,947	8,486,504	27,567,451
1875–'76	332	2,300	23,325	157	137	38	28,363,068	13,249,774	41,612,842
1876–'77	328	2,370	24,923	197	98	33	24,901,537	10,598,829	35,500,366
1877–'78	329	2,413	25,788	224	81	24	28,727,752	12,181,928	40,909,680
1878–'79	324	2,493	26,882	258	50	16	31,140,298	15,147,179	46,287,477
1879–'80	328	2,627	29,586	291	28	9	28,505,861	19,546,754	48,052,615
1880–'81	333	2,812	32,269	309	20	4	38,716,787	24,505,243	63,222,030
1881–'82	343	3,046	35,476	324	16	3	34,317,535	28,401,944	62,719,479
1882–'83	358	3,365	40,515	343	12	3	44,486,319	42,985,219	87,471,537
1883–'84	376	3,715	46,158	368	6	2	42,050,639	47,130,664	89,181,303
1884–'85	408	4,196	56,119	402	4	2	49,362,459	54,664,424	104,026,883
1885–'86	399	4,188	57,194	395	3	1	41,990,474	28,712,694	70,703,168
1886–'87	401	4,276	58,770	397	3	1	44,360,835	38,705,877	83,066,712
Average of 16 years	348	2,890	33,735	248	81	19	32,266,883	23,353,984	55,620,867

TABLE A.—*Number, arrangements, and days' work of the sugar factories, etc.*—Continued.

Fiscal year.	Proportion of purchased crop beets to total consumption.		Area of own crop.	Beets raised per hectare.	Days of 12 hours in which beets were consumed.	Beets consumed per day of 12 working hours.
1	11	12	13	14	15	16
	Per ct.	*Per ct.*	*Hectares.*	100 *ks.*		100 *ks.*
1871–'72	66.8	33.2	73,690	204	64,451	349
1872–'73	66.0	34.0	82,590	254	87,677	363
1873–'74	68.6	31.4	88,877	272	91,254	387
1874–'75	69.2	30.8	92,655	206	70,020	394
1875–'76	68.2	31.8	96,724	293	91,675	458
1876–'77	70.1	29.9	98,725	252	70,608	503
1877–'78	70.2	29.8	104,723	274	75,320	543
1878–'79	67.3	32.7	107,679	289	75,895	610
1879–'80	59.3	40.7	113,003	252	70,909	678
1880–'81	61.2	38.8	118,431	327	82,052	771
1881–'82	54.7	45.3	121,256	283	76,325	822
1882–'83	50.9	49.1	129,262	344	94,816	923
1883–'84	47.2	52.8	140,843	299	89,956	991
1884–'85	47.5	52.5	150,077	329	97,065	1,072
1885–'86	59.4	40.6	138,869	302	65,642	1,077
1886–'87	53.4	46.6	147,782	300	72,593	1,144
Average of 16 years	58.0	42.0	112,828	286	79,766	697

TABLE B.—*Business results of the sugar factories in the German Customs Union.*

Fiscal years.	Taxed sugar beets (Table A, column 10) produced.			
	Juice.	Out of juice (column 2).		
		Raw sugar.	Molasses.	Total salable produce (columns 3 and 4).
1	2	3	4	5
	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*
1871–'72	2,629,931	1,864,419	638,917	2,503,336
1872–'73	3,716,170	2,625,511	915,887	3,541,398
1873–'74	4,121,142	2,910,407	1,058,183	3,968,590
1874–'75	3,690,442	2,564,124	976,028	3,540,152
1875–'76	5,028,183	3,580,482	1,339,524	1,920,006
1876–'77	4,055,036	2,894,227	1,111,011	4,005,238
1877–'78	5,155,951	3,780,091	1,228,128	5,008,219
1878–'79	5,761,803	4,261,551	1,336,515	5,598,066
1879–'80	5,544,094	4,094,152	1,313,709	5,407,861
1880–'81	7,393,360	5,559,151	1,649,842	7,208,993
1881–'82	7,740,044	5,997,222	1,508,129	7,505,351
1882–'83	10,935,556	8,319,953	1,963,047	10,283,000
1883–'84	12,168,794	9,401,093	2,079,781	11,480,874
1884–'85	14,486,187	11,230,303	2,596,997	13,827,300
1885–'86	10,257,772	8,081,049	1,801,775	9,882,824
1886–'87	12,459,832	9,856,278	2,158,872	12,015,150
Average of 16 years	7,195,894	5,438,751	1,479,771	6,918,522

TABLE B.—*Business results of the sugar factories, etc.*—Continued.

Fiscal years.	Produced out of 100 kilograms taxed sugar beets.				Produced out of 100 kilos of juice.		Beets consumed to manufacture 100 kilos raw sugar.
	Juice.	Raw sugar.	Molasses.	Total salable produce (columns 7 and 8).	Raw sugar.	Molasses.	
1	6	7	8	9	10	11	12
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	*Kilos.*	100 *kilos.*
1871–'72	11.68	8.28	2.84	11.12	70.89	24.29	12.87
1872–'73	11.68	8.25	2.88	11.13	70.65	24.65	12.11
1873–'74	11.68	8.25	3.00	11.25	70.62	25.68	12.12
1874–'75	13.35	9.30	3.54	12.84	69.67	26.52	10.75
1875–'76	12.08	8.60	3.22	11.82	71.21	26.64	11.62
1876–'77	11.42	8.15	3.13	11.28	71.37	27.40	12.27
1877–'78	12.60	9.24	3.00	12.24	73.32	23.82	10.82
1878–'79	12.45	9.21	2.89	12.10	73.96	23.20	10.86
1879–'80	11.54	8.52	2.73	11.25	73.85	23.70	11.74
1880–'81	11.69	8.79	2.61	11.40	75.19	22.32	11.37
1881–'82	12.34	9.56	2.40	11.96	77.48	19.48	10.46
1882–'83	12.50	9.51	2.24	11.75	76.08	17.95	10.51
1883–'84	13.65	10.54	2.33	12.87	77.25	17.09	9.49
1884–'85	13.93	10.79	2.50	13.29	77.52	17.93	9.26
1885–'86	14.51	11.43	2.55	13.98	78.78	17.56	8.75
1886–'87	15.00	11.87	2.60	14.47	79.10	17.33	8.43
Average of 16 years	12.94	9.78	2.66	12.44	75.58	20.56	10.28

TABLE C.—*Imports and exports of sugar in the German Customs Union.*

Fiscal years.	Imports.				Exports.				
	Refined and raw sugar, Dutch standard, No. 19 and upwards.	Raw sugar below No. 19.	Sirup and dutiable molasses.	Molasses for distilleries.	Raw sugar, etc. (against drawback).	Candy sugar, (against drawback).	Other hard sugar, etc. (against drawback).	Sugar without drawback.	Molasses and sirup.
1	2	3	4	5	6	7	8	9	10
	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*
1871–'72	127,305	315,832	73,298	81,341	56,665	41,763	16,328	19,394	8,563
1872–'73	124,886	97,562	69,323	23,716	81,777	51,331	26,472	8,043	35,559
1873–'74	161,483	84,148	61,021	50,422	118,092	41,120	26,310	21,182	79,363
1874–'75	141,010	89,133	56,587	50,336	28,838	39,452	15,359	16,531	79,829
1875–'76	145,273	24,526	48,397	4,748	458,942	47,125	25,329	19,588	84,588
1876–'77	77,097	10,172	53,189	28,600	462,189	73,935	43,423	9,857	122,624
1877–'78	49,153	11,674	41,028	7,034	712,010	140,013	83,416	6,764	148,744
1878–'79	30,012	15,304	38,329	31,827	1,034,718	193,561	113,966	2,243	174,507
1879–'80	29,831	16,764	26,996	72,369	951,616	262,364	97,052	2,073	171,576
1880–'81	22,654	12,652	33,220	48,510	2,214,420	853,787	206,814	1,056	160,782
1881–'82	22,016	15,049	33,139	4,588	2,539,310	399,160	144,130	615	211,183
1882–'83	21,038	23,705	35,369	8,611	3,907,027	493,811	242,181	646	141,473
1883–'84	15,577	18,763	32,216	1,695	4,911,761	642,469	298,679	597	255,381
1884–'85	12,645	20,668	33,372	2,816	5,587,931	760,154	318,852	403	650,618
1885–'86	12,300	26,203	28,492	....	4,040,715	660,196	305,689	365	551,206
1886–'87	14,618	15,675	27,166	1	4,896,801	1,303,789	238,828	414	245,094
Average in 16 years	63,494	49,864	43,350	25,727	1,997,051	343,377	131,552	6,861	195,094

TABLE D.—*Sugar consumption and revenue from sugar duties in the German Customs Union.*

Fiscal years.	Production of raw sugar.	Imports of sugar reduced to raw sugar.	Total production and imports.	Exports of sugar reduced to raw sugar.	Consumption of sugar computed to raw sugar. Total (column 4 and 5).	Consumption of sugar computed to raw sugar. Per head population.	
1	2	4	3	5	6	7	
	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	100 *kilos.*	*Kilos.*	
1871-'72	1, 864, 419	496, 332	2, 360, 751	142, 757	2, 217, 994	5. 5	
1872-'73	2, 625, 511	270, 852	2, 896, 363	179, 382	2, 716, 981	6. 6	
1873-'74	2, 910, 407	289, 530	3, 199, 937	216, 550	2, 983, 387	7. 2	
1874-'75	2, 561, 124	276, 907	2, 841, 031	108, 134	2, 732, 897	6. 5	6. 5
1875-'76	3, 580, 482	212, 532	3, 793, 014	561, 209	3, 231, 805	7. 6	
1876-'77	2, 894, 227	125, 060	3, 019, 287	603, 538	2, 415, 749	5. 6	
1877-'78	3, 780, 091	88, 830	3, 868, 921	967, 785	2, 901, 136	6. 7	
1878-'79	4, 261, 551	79, 710	4, 341, 261	1, 380, 768	2, 960, 493	6. 7	
1879-'80	4, 094, 152	65, 842	4, 159, 994	1, 344, 857	2, 815, 137	6 3	6. 6
1880-'81	5, 559, 151	56, 073	5, 615, 224	2, 839, 039	2, 776, 185	6. 8	
1881-'82	5, 997, 222	57, 330	6, 054, 552	3, 144, 103	2, 910, 419	6. 4	
1882-'83	8, 319, 953	66, 012	8, 385, 965	4, 725, 514	3, 660, 451	8. 1	
1883-'84	9, 401, 093	53, 761	9, 454, 854	5, 958, 144	3, 496, 710	7. 7	
1884-'85	11, 230, 303	53, 035	11, 283, 338	6, 737, 274	4, 546, 064	9. 9	7. 9
1885-'86	8, 081, 049	55, 745	8, 136, 794	5, 003, 215	3, 133, 579	6. 8	
1886-'87	9, 856, 278	46, 779	9, 903, 057	6, 611, 280	3, 291, 777	7. 0	
Average in 16 years	5, 438, 751	143, 395	5, 582, 146	2, 532, 722	3, 049, 424	7. 0	

Fiscal years.	Internal revenue. Taxes on beet sugar.	Internal revenue. Duties of entry.	Internal revenue. Total revenue.	Internal revenue. Drawbacks on exports.	Internal revenue. Net revenue.	Internal revenue. Per head of population.
1	8	9	10	11	12	13
	Marks.	*Marks.*	*Marks.*	*Marks.*	*Marks.*	*Marks.*
1871-'72	36, 014, 691	12, 498, 225	48, 512, 916	3, 875, 916	44, 637, 000	1. 11
1872-'73	50, 904, 813	7, 127, 469	58, 032, 282	3, 201, 150	54, 831, 132	1. 33
1873-'74	56, 460, 222	7, 778, 976	64, 239, 198	3, 595, 569	60, 643, 629	1. 46
1874-'75	44, 107, 920	7, 217, 593	51, 325, 513	1, 641, 786	49, 683, 727	1. 18
1875-'76	66, 580, 546	5, 672, 131	72, 252, 677	8, 888, 608	63, 364, 069	1. 49
1876-'77	56, 800, 570	3, 353, 926	60, 154, 496	11, 389, 541	48, 764, 955	1. 14
1877-'78	65, 455, 491	2, 369, 082	67, 824, 578	17, 855, 173	49, 969, 400	1. 15
1878-'79	74, 059, 961	2, 111, 772	76, 171, 733	25, 359, 970	50, 811, 763	1. 16
1879-'80	76, 875, 459	1, 729, 536	78, 604, 995	24, 141, 395	54, 463, 600	1. 23
1880-'81	101, 163, 969	1, 480, 067	102, 644, 936	56, 547, 988	46, 096, 948	1. 12
1881-'82	100, 351, 163	1, 518, 056	101, 869, 219	43, 412, 561	56, 456, 658	1. 29
1882-'83	139, 954, 448	1, 730, 108	141, 684, 556	74, 397, 666	67, 286, 890	1. 49
1883-'84	142, 690, 084	1, 400, 481	144, 090, 565	96, 302, 249	47, 788, 316	1. 05
1884-'85	166, 443, 012	1, 378, 602	167, 821, 614	128, 452, 707	39, 368, 907	. 86
1885-'86	113, 125, 068	1, 434, 687	114, 559, 755	90, 067, 544	24, 492, 211	. 53
1886-'87	131, 213, 410	1, 231, 770	142, 445, 180	114, 181, 546	28, 263, 634	. 60
Average in 16 years	89, 512, 552	3, 752, 086	93, 264, 638	43, 956, 961	49, 307, 677	1. 13

JOSEPH FALKENBACH, *Consul.*

UNITED STATES CONSULATE,
Barmen, April 27, 1888.

GERMANY—1890.

REPORT BY CONSUL-GENERAL EDWARDS, OF BERLIN.

As throwing light on the systematic methods employed in Germany for the purpose of increasing the percentage of sugar in sugar beets, the following translation of the Hadmersleben Sugar Factory's instructions to beet-farmers may be found of interest:

INSTRUCTION AS TO THE CULTIVATION OF BEETS FOR THE HADMERSLEBEN SUGAR FACTORY.

SEC. 1. Every stockholder is bound each year, on the 15th of September at latest, to deliver to the superintendents of the factory a specification of that area of ground on which he purposes to plant sugar beets for the stock company in the following year, in conformity with his obligation, according to the number of his shares. The specification must contain exact information as to the position, area, manured condition, and series of crops during the three preceding years. The beets must not be planted on moist, moor, or saltpeter land, or on land which, within the preceding years, has been devoted to clover, esparcet, or lucern. Fresh-broken land (within the first five years) must not be devoted to beet-culture.

Further, the cultivation of sugar beets is forbidden in the first year after lying fallow and also after oil-producing crops, pulse, all kinds of cabbage and similar vegetables, and all vegetables which did not come to maturity in the preceding year and for two years after cess water has been used.

The superintendents must give notice to each stockholder, by the 1st of November at latest, as to whether or not the ground offered has been accepted; and, if not accepted, the reasons for the rejection, which must be based upon the above requirements, are to be given.

The stockholder in question, instead of the rejected land, has to offer other acceptable land, until the required amount has been supplied.

SEC. 2. The superintendents and inspectors examine the condition and extent of land offered for beet-culture and the specifications given by the stockholders, and oversee the planting, cultivation, and delivery of the beets. They have the power to satisfy themselves in every practical way and even to remeasure the land, if they see fit. Should it transpire that a stockholder has given inaccurate information he will be obliged to pay the costs incurred in proving the deception.

SEC. 3. Fertilizing with iron shavings, salt, and potassic salt is forbidden; but it is permitted to manure belt land with at most 120 centners of animal dung per morgen (acre), in case it is plowed under before December 31, or later, if the manure was applied at the proper time.

In artificial manures the ratio of nitrogen to phosphoric acid in solution must be 1 to 1.

The use of not more than 2 centners of Chili saltpeter per morgen is permitted.

It is forbidden to use more than 40 (German) pounds of nitrogen per morgen.

Where stable manure is used, 12 per cent. extra of phosphoric acid in solution is to be added.

Placing manure on the plants is forbidden.

Every stockholder is further bound to plant his beets before May 15, and, after that date, can do so only in exceptional cases and with the consent of the superintendents.

A second planting is permitted until June 1, but notice of the same must be given to the superintendents.

He is further bound to thin out the beets at the right time, to hoe at least three times and each time to hill; he must, moreover, devote the greatest possible industry to

the cultivation of the beets. On an average, the beets must be drilled not more than 14 inches apart and the plants left at intervals of not more than 12 inches. Before the harvest the plants must be robbed of no part of their leaves, and must be delivered at the factory clear, as far as possible, of leaves and earth and in such condition as to fill every requirement for the rational winning of sugar.

SEC. 4. The necessary beet seed are supplied by the factory to every stockholder—36 kilograms per hectare or 18 German pounds (half a kilogram) per morgen—free of charge. It is positively forbidden to use other seed. Every stockholder is, however, free, if he wishes, to drill more than 36 kilograms per hectare and to buy at cost price from the factory the desired extra quantity. The request must, however, be made to the superintendents early enough to allow them time to purchase the seed. This regulation applies also to where, for any cause, a second planting is necessary; and in such case, also, the stockholder must pay cost price for the seed.

SEC. 5. The superintendents determine, after making an estimate of the expected crop, what quantity of beets for the months of September and October each separate stockholder must deliver daily and weekly to the factory. Every stockholder is bound, by the 31st of October, with the greatest possible accuracy, to report to the directors (superintendents) the anticipated result of his beet crop.

On the basis of this result the superintendents issue a second notice as to the daily and weekly quantity of beets to be delivered by each stockholder.

Every stockholder is bound to comply with these requirements of the superintendents. The superintendents, however, may, in exceptional cases, make such allowances as the circumstances seem to demand.

SEC. 6. The total weight of beets delivered by wagon is to be decided by weighing on the factory scales. The total weight of beets delivered by railway is to be determined by weighing on the scales at the depot in Hadmersleben. The determining of the net weight, less the allowance for tops, dirt, etc., is left to the factory superintendents.

Against the decision of the factory superintendents the stockholder has the right of appeal to the directors. The decision of the directors is final.

The difference between the estimated net weight and the actually consumed taxed weight at the end of the business year is apportioned by percentage on all stock and other beets delivered and payments made accordingly.

SEC. 7. Every stockholder is bound to answer conscientiously every question put to him by the superintendents or inspectors.

SEC. 8. In case an actionary, or stockholder, does not comply in one or more points with these instructions, and especially if he plants beets on rejected land or makes untrue statements to the superintendents or inspectors or does not comply with the instruction in regard to the use of artificial manures, the superintendents may refuse the beets or may accept them at a lower price if they see fit.

The above rules as to the mode of culture insisted on apply, also, to other farmers not shareholders, the difference being that they receive less for their beets.

Great pains are taken in raising the seed for the factories, the object constantly in view being the increase in the percentage of sugar in the beet and the increase in the yield. Professor Maercker has, however, expressed the opinion that the improvement of the beet can not be pressed much further in the direction of increasing the sugar ingredient without endangering its productiveness. The object to be kept in view in the future, therefore, will be the evolution of a beet with the present high percentage of sugar and at the same time more productive.

As is well known, it takes two years to produce seed. In the first year choice seed are planted and beet roots grown. These roots are individually carefully examined and analyzed before being replanted in the second year to produce seed. The reliable seed-grower tests every single root and plants only such as are found to be especially rich in sugar.

When it is remembered that this systematic method of improving the beet root has been pursued for many years, the precautions taken by factory managers to compel the use of only such seed as have been delivered by themselves will be better understood.

W. H. EDWARDS,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Berlin, June 30, 1890.

GERMANY—1890.

REPORT BY CONSUL MERRITT, OF CHEMNITZ.

Sixteen millions of dollars is the sum of money, in round figures, which the United States sent to Germany to pay for beet sugar bought during the fiscal year ended June 30, 1890. Every pound of the sugar paid for by the $16,000,000 above mentioned was made from sugar beets grown in Prussia, in a latitude exactly on a line with the frozen regions of Labrador. There are within the United States, lying between the thirty-eighth and forty-second degrees of latitude, a great many millions of acres of land which are as thoroughly adapted to the culture of the sugar beet as any land on earth. The question naturally occurs to the mind of an American, why should the $16,000,000 paid for beet sugar be sent to Germany, instead of being paid to American agriculturists in the valleys of the Ohio, Mississippi, and Missouri Rivers? It is a subject of profound interest and has recently been considered by Congress as one of paramount national importance. It is a fact which no one will care to dispute that the United States is the greatest consumer of sugar in the world to-day. The consumption of sugar per capita per annum may be said to be as follows in five countries from which statistics are obtained: England, 60 pounds; United States, 44 pounds; France and Switzerland, 26 pounds; Germany, 18 pounds. Hence, with an enormous majority of population, the United States may be called the greatest sugar-consuming nation on earth.

EARLY NOTES ABOUT SUGAR.

One of the most interesting chapters in the history of every great invention or discovery is the recital of facts which show the enmity, obstruction, and incredulity which have had to be encountered and overcome before the world has been willing to accept the blessings and

benefits which progressive, enlightened, and scientific minds have placed within the reach and at the service of mankind. Well known, indeed, are the stories of the struggles which everywhere occurred when the potato was imported; the exasperating fanaticism manifested to check the spread of the use of tobacco; the innumerable statements made to prove the evil effects of the use of coffee, tea, and chocolate; not to mention the mad terror which seized on certain portions of the population when railways and other wonderful and splendid inventions were put in operation. But success was finally achieved and our race is bettered by it. Much less is known regarding the struggle through which sugar went or the misrepresentations and defamation which were hurled upon it before it rose from the position of a seldom-used and luxurious "salt" to be one of the most popular, necessary, and comfort-giving articles used in domestic economy.

The use of sugar in Europe was for long years most notably restricted. This entire portion of the globe was not consuming more than 1,500,000 metre centners per annum during the middle portion of the last century. The sale of sugar was a privilege of druggists in France until late in the seventeenth century. This monopoly did not tend to make the price of sugar cheap, as druggists in those days were not noted for low prices to any greater extent than they are at the present time; and it is doubtful if Scarron, the comedy writer, did not do his thrifty sister injustice when he accused her of stinginess because she made use of a sugar bowl with unusually small sifting holes in its top. With people who were not in independent circumstances sugar was at that time much more of a luxury than are champagne or truffles at the present time.

In his Physiology of Taste, published in 1800, Brillat-Savarin says:

> For more than 80 years the droll remark held good that the use of sugar injured a man only as far as related to his pocket book. Since then, however, the use of sugar has increased day by day until it has become so common that all well-to-do people spend annually more money for sugar than for bread.

Sugar was regarded with the greatest distrust. One declared that it overheated the system, another that it congested the lungs, others that it was a direct cause of apoplexy. Many natural philosophers of the seventeenth and part of the eighteenth century who were inexperienced in chemical and medicinal experiments passed severe sentence in erudite (?) discourse, endeavoring to show that sugar was altogether and utterly destitute of good qualities. Kunkel von Löwenstjern declared openly that sugar was, without doubt, injurious, because an experiment he had made sugar had accelerated fermentation, and hence sugar would bring the human body into a state of pernicious fermentation, accompanied by a host of stomach diseases. The equally well-known English scientist Boyle, discoverer of the composition of atmospheric air, arrived at a similar conclusion, particularly on account of his discovery that all sweet and farinaceous substances are susceptible of fermentation.

Garenzières had the courage or audacity in 1647 to make the monstrous declaration that sugar was not only not nutritious, but that—

It is a poison; and no better deed can be done than send it back to India, from whence it came, because only by that action can consumption, which its immoderate use has developed, be checked.

Willis charges sugar with being responsible for about every ill that flesh is heir to, while Pauli charges that it heats the body inordinately, "to the imminent danger of inflamed lungs." Ray, Hermann, and Leméry attacked sugar from different directions, while, in conclusion, Beckmann, in his Supplement to the History of Great Discoveries, says that for doves, pigeons, lizards, frogs, and bees sugar is poison, but that for canary birds it is healthful, on account of which canary birds are called "sugar birds."

In all epochs and ages the war against sugar has been a "fight with windmills." And sugar, which was once treated with hostility and discredit, has taken its proper place in the front rank of human necessities and comforts. Its use and its production seem unlimited, for, while in 1876 the entire sugar product of the world was 31,000,000 meter centners, in 1884-'85 it had reached the enormous volume of 54,000,000 meter centners and has been increasing annually since then.

THE DISCOVERY AND DEVELOPMENT OF THE BEET-SUGAR INDUSTRY.

The earliest authentic record of beet sugar proves it to be a discovery of a learned German, Dr. Andreas Sigismund Marggraf, professor of chemistry and a member of the Berlin Academy of Sciences. He was born in Berlin March 3, 1709. In the records of the Berlin Academy of Sciences is a paper prepared by Dr. Marggraf detailing in full his discovery of sugar in beets, which was identical with that obtained from sugar cane. Dr. Marggraf discussed in his treatise the propriety of attempting to make beet sugar and sought to prove that profit could be derived from the undertaking. Among other things he said:

It must be apparent, from the practical tests mentioned, that sugar can be as successfully made in this country as where the sugar-cane grows.

It is not of record that the learned Professor Marggraf pursued his researches further than the theoretical disclosures mentioned in his dissertation above alluded to; but a pupil of his, Franz Carl Achard, who became deeply interested in the subject, developed the idea of beet sugar making and proved that it could be done with profit. In 1799 Achard addressed a petition to Frederick William III, King of Prussia, and besought the patronage and protection of that monarch in the prosecution of beet-root-culture and the manufacture of beet sugar. Being finally persuaded of the merits of the discovery, the king subsidized the industry with $35,000. This fund was expended in the purchase of land in Lower Silesia, where, in 1801, a factory was built, and in the following year the process of making beet sugar began. Within a year

six other factories were started: one in Russia, two in France, and three in Prussia. Then came the Napoleonic wars; the development of the beet-sugar industry was for many years at a standstill. Achard was also the victim of a disastrous conflagration in 1809, which entirely destroyed his factory and machinery. Although heavily involved in debt, Achard had both faith and courage and set himself to work in the direction of rehabilitation. The king released him from the payment of the former loan and advanced him further financial aid, with which Achard founded a school for practical instruction in the industry of beet sugar. Fortune did not smile on him, however, and at the time of his death in 1821 Achard had not had an opportunity to see the industry to which he had consecrated the best years of his life in a flourishing and prosperous condition.

In France a factory was established on the Achard system at Lille by Crespel Delisse, whose untiring energy, great capability, and remarkable sagacity rescued the sugar-beet industry from depression and dissolution and placed it on a prosperous footing as one of the great and successful enterprises of the age. In 1830 Delisse was owner of several out of the hundred and more factories in operation and was recognized as a great authority and honest counselor in matters pertaining to the industry.

PRESENT CONDITION OF THE BEET-SUGAR INDUSTRY.

Subsequent to the time last mentioned the making of sugar from beets has made rapid progress. Scientific men have bent the best of their powers and energies to bring about methods of treating the vegetables and extracting the utmost saccharine from them and for the invention of improved machinery for diffusion, evaporation, and kindred uses. Flattering successes and triumphs have rewarded them. The results of philosophic experiments as to the quality of beets best adapted to certain conditions of soil and climate and the chemical researches which have been made for the purpose of discovering what fertilizers are the best have entirely covered these questions. The results of these exhaustive investigations have been made public and can be known by all.

The output of beet sugar from the many hundreds of factories in Europe for the "Kampaign" of August 1, 1889, to July 31, 1890, is one of the greatest ever known, and rivals the product of the cane-sugar districts of all parts of the world, both in quality and amount. The cost of production has been reduced to less than that of any former year. This is not attributable to a larger development of saccharine in the beets, but is the result of scientific and technical improvements in the management of the factories. Formerly it was calculated that 12½ pounds of beets were required to produce a pound of sugar; now sugar can be produced in proportions much more favorable. In the lowest estimate, 832 pounds of beets make 100 pounds of sugar, while the highest estimate requires only 10½ pounds of beets for a pound of sugar.

There are about thirty kinds of beets which are grown for the sugar factories of Germany. Each kind has some claim of special merit for special localities. Much depends on the kind of soil to be planted and in the selection of the beets to be sown. Among the most necessary elements in the successful cultivation of sugar beets are the richness of the beets in saccharine, the procuring of the seed from the most reliable sources, the proper preparation of the soil, the use of the most improved fertilizers, and the careful attention to and harvesting of the crops. A visit to the beet-growing districts will disclose that the best crops are obtained from a loose, sandy loam called a mild soil. The roots grow deep and require soil prepared fully 12 inches deep supplemented by a subsoil. Care is observed to avoid wet soil. Certain districts have certain regulations regarding the width between the rows and the distance between the beets in the rows. All are governed by fixed intervals, and it is stated that the nearer the beets grow together the more saccharine they contain, but the smaller they grow. On the better class of soils beets should be planted closer than on poorer soils if uniformity of size is desired. Growing of beets is decidedly beneficial to the soil and improves it for cereals. Crops should be reasonably alternated in order to rest the soil.

FUTURE OF BEET SUGAR IN THE UNITED STATES.

The future of beet sugar in the United States is problematical. It can not be gainsaid that the climate and soil of large portions of the States of Ohio, Indiana, Illinois, Missouri, Iowa, Kansas, Nebraska, Wisconsin, Minnesota, and many other districts are perfectly adapted to the culture of sugar beets. The Congress of the United States has recently taken novel and special action, which would give encouragement and protection to the enterprise should the American agriculturists embark in the beet-sugar industry. All machinery needed to convert the saccharine of beets into fine sugar is, by act of Congress, permitted to be imported free of duty from now on until the 1st day of July, 1892. A bounty of 2 cents per pound will be paid by the Government of the United States to the manufacturers of sugar for an indefinite period of time.

It is likely that the Government would do more. In Louisiana, on the Magnolia sugar plantation, owned by Ex-Governor Warmoth, lying some 40 miles south of New Orleans, on the Mississippi River, the United States has, within recent years, erected a magnificent experiment station in the interest of cane-sugar production. The vast benefits of this station to sugar-growers can be relied upon to induce the Government at Washington to consider a proposition for the establishment of a similar station in the interests of a beet-sugar industry, should such an undertaking be entered upon by the farming community of our country, and the production of sugar from beets can be easily transferred to that belt of country so admirably adapted to its culture which

has been mentioned before. The information and experience gathered through all the costly experiments and mistakes which have been made and paid for during nearly a hundred years can be turned, without cost, to the benefit of our people, and profitable employment can be given to many thousands both winter and summer.

It would not be difficult to enter upon this industry at once. In order that all interested might share in the undoubted prosperity which would follow, the plan here submitted is modestly offered. A stock company, with a capital stock of $250,000 in 2,500 shares of $100 each, could be organized. Three-fifths of the shares could be made "beet shares" and two-fifths cash shares. Ten or 20 per cent. of the beet shares could be paid in cash, and the balance might be gradually deducted from the money due the shareholders for the beets delivered by them to their factory. The cash shares could be paid for in such manner as determined upon. The management of the concern is to be determined upon by the share-holders. This plan has been found to work with unqualified success in Germany, where many factories are in operation on this basis.

The bounty to be paid by the Government insures at least $4 per acre. Besides that small sum, the agricultural element will receive compensation for the beets raised, also a share of the residue from the beets after using, and which is very good fodder, and, what is of equal importance—in fact, the best of all—a share of the dividends. As has been heretofore stated, beet culture improves the soil, which is a consideration by no means to be underestimated nor overlooked.

In the beginning of this it is stated that the sum of $16,000,000 was paid by the people of the United States to the beet-sugar makers of Germany within one year. This sum is nearly three times as much money as our people paid for any other given article imported from Germany, cotton having come next with $6,000,000.

It does not seem proper nor consistent that an agricultural country like the United States should be dependent for any article of purely agricultural character on foreign countries, especially when the United States has fully one hundred times as much land adapted to the production of that article as is available in the country from whence the article comes.

It would be a matter of justice and equity, as well as of patriotism and profit, if the people of the United States (who have always treated, through their representatives, the people of all foreign nations with scrupulous fairness and with no wrongful discrimination against any) should convert some part of the vast domain now used for growing corn to fatten and nourish the splendid pork of our Western States into acres of sugar beets. In European beet-sugar countries American pork is forbidden entry.

H. F. MERRITT,
Consul.

UNITED STATES CONSULATE,
Chemnitz, October 25, 1890.

GERMAN SUGAR-BEET LEGISLATION.

REPORT BY COMMERCIAL AGENT WASHBURN, OF MAGDEBURG.

INTRODUCTION.

Two things have contributed to Germany's present ascendency in the production and exportation of raw beet sugar. The first is the superiority of soil and climate for the growing of the beet root; the second is the peculiar encouragement given the industry itself by the Government. It is to this latter factor that I wish to call attention in this report.

NATURE OF THE GERMAN TAX AND HOW IT WORKS.

The imposing of a tax on raw beets destined for the manufacture of sugar, with the accompanying rebate for the finished product when exported, is German in its origin, and is known as the "material tax," or "weight duty." This system presents no difficulties so long as the manufactured sugar goes into the home consumption, because the state treasury retains the amount of the tax in full. The moment, however, that the product is destined for the foreign market it imposes upon the customs authorities the responsibility of determining the exact amount of rebate to be granted. Though it is universally recognized that the effect of the present system is one of concealed bounties, the theory of the law is that of reimbursement. In other words, the Government contracts to return the amount of the tax upon all exported sugar, thus enabling the seller the better to compete in the world's market. To this end it is necessary to establish by law the estimated amount of raw beets required to produce a given quantity of sugar. Clearly, this will vary in different years and in different districts. An average rebate is therefore always sought. It thus happens that to those factories which work up beets rich in sugar and which have improved appliances the rebate comes, not as a reimbursement only, but as a bounty as well.

LEGISLATION, PAST AND PRESENT.

The history of recent sugar legislation is one of experiments, but all consistently tending towards one ultimate object—the suppression of the premiums. Prior to 1861 no rebate was allowed. The material tax pure and simple had, however, existed since 1844. The law of September 1 of that year placed the duty at 30 pfennigs* per 100 kilograms† of raw beets. This tax was steadily increased from time to time up to the passage of the present law, when it was materially modified.

* 1 mark of 100 pfennigs=23.8 cents. † 1 kilogram=2.205 pounds.

The accompanying table shows the amount of tax per 100 kilograms from 1844 to 1891.

Period of enforcement.	Amount.	Period of enforcement.	Amount.
	Marks.		*Marks.*
September 1, 1844, to September 1, 1850..	0.30	September 1, 1869, to September 1, 1886	1.60
September 1, 1850, to September 1, 1853..	0.60	September 1, 1886, to September 1, 1888	1.70
September 1, 1853, to September 1, 1858..	1.20	September 1, 1888	0.80
September 1, 1858, to September 1, 1869..	1.50		

Law of 1869 *and its important results.*—In 1869 a thorough classification of the material tax and rebate took place. This law remained unchanged until 1883, and is regarded as having a more important bearing on the development of the beet-root industry than any other law which has been placed on the statute books. Its main provisions are here appended. It imposed a weight duty of 1.60 marks upon each 100 kilograms of raw beets. Upon home or foreign sugar exported beyond the customs frontier, the following rebate was granted per 100 kilograms: (1) For raw sugar of at least 88 per cent. polarization, 18.80 marks; (2) for candy and sugar in white, full, hard loaves up to 25 pounds net weight, or sugar crushed in the presence of the customs authorities, 23 marks; (3) for all other hard sugars, as well as for all white, dry (containing not less than 1 per cent. of water) sugar in crystals, crumbs, or flower form of at least 98 per cent. polarization, 21.60 marks. To receive the benefit of this drawback the amount exported must at least have reached 500 kilograms. Exportation could only take place through custom-houses indicated by the Bundesrath, and fines and penalties were attached for false declarations.

Two important results of this law are to be noted. Since the tax was imposed, not on the sugar itself but on the raw beets, farmers took great pains to increase the saccharine richness of the beets, and the manufacturers strove to devise more economical methods of extracting the sugar. What this means is most forcibly illustrated by a reference to recent French legislation. In 1884 it was estimated that it required about 17 tons of roots in France to produce a ton of sugar, as against 9½ tons in Germany for the same purpose. In that year the German material tax was adopted.

Its results are seen in the following table, which shows the quantity of raw beets required to produce a double centner* for the years 1884–'85 to 1889–'90, inclusive:

Year.	Quantity.	Year.	Quantity.
	D. centners.		*D. centners.*
1884–'85	15.02	1887–'88	9.44
1885–'86	11.42	1888–'89	9.16
1886–'87	10.15	1889–'90	8.56

* 1 double centner = 100 kilograms.

For the current year, it is believed that the ratio will sink to 7.50 double centners of raw beets to 1 double centner of sugar.

Experimental legislation.—As a source of revenue, the law of 1869 was a failure. While under its fostering provisions the production of sugar was yearly increased, and with it the export trade, the receipts from the material tax showed no corresponding growth. Accordingly, measures looking to the modification of the law were initiated by the preliminary act of July 7, 1883. This act merely lowered the rebate scale and proposed further legislation in two years. In the meantime, in the autumn of 1883, a commission was appointed which examined carefully into all proposals relating to the taxing of sugar. Their recommendations were embodied in a report to the Reichstag in the early summer of 1884 (June 11). Following this, on May 13, 1885, the law of 1883, about to expire by time limit, was given another year's lease of life, that is, until August 1, 1886. This afforded opportunity for further investigation. The result was the law of July 1, 1886. This measure raised the material tax 10 pfennigs and still further lowered the rebate scale. It was hardly published before it was seen to be insufficient. A considerable bounty was still possible. Just what the bounty was I have not been able to learn. In a speech on July 9, 1884, the French minister of agriculture is reported to have said that it was equivalent to 3 francs per 100 kilograms on the whole crop and 7 francs on the amount exported.

Unsatisfactory results of the present law.—It becoming evident that no effectual reform could be had by adhering to the old system, a new principle more sweeping and radical in its provisions than anything hitherto attempted, was introduced into the law of July 9, 1887. This was the consumption tax, by which all sugars entering into home consumption were required to pay a certain duty. The old material tax on the beet root and the rebate were still retained, though both were reduced. This law, which is still in force, went into effect on August 1, 1888. The schedules were arranged as follows:

The material tax was fixed at 80 pfennigs per 100 kilograms. This was a reduction of 90 pfennigs.

The rebate per 100 kilograms was: (1) For raw sugar of at least 98 per cent. and for refined sugar containing less than 98 per cent., but at least 90 per cent., of sugar, 8.50 marks; (2) for candies and for sugars in white, full, hard loaves, blocks, plates, sticks, or cubes, or crushed in the presence of the revenue officers and for other sugars of at least 99½ per cent. purity which at any time may be classified by the federal council, 10.65 marks; (3) for all other hard sugar, as well as for all white, dry (not containing over 1 per cent. water) sugar in crystal, crumb, or flower form containing at least 98 per cent. sugar, so long as they do not fall under 2, 10 marks.

The actual workings of this measure, while yielding to the imperial treasury a larger income than was possible under the old system, do not seem to have met the expectations of its projectors. It seems to be re-

garded as a financial fiasco, and it is believed that handsome profits still accrue to the manufacturers.

The clear amount received by the Government from the sugar tax for the last five years, after deducting the managing expenses, which are reckoned at about 4 per cent., is:

	Marks.
1885–'86	16,932,822
1886–'87	13,510,145
1887–'88	21,270,284
1888–'89	47,298,681
1889–'90	60,369,848

An analysis of the receipts for the last two working years, during which time the additional consumption tax provided for by the new law has been in force, shows the following:

1888–'89.

		Marks.
78,961,830 double centners of raw beets were consumed, on which there was a material tax of 80 pfennigs per 100 kilograms		63,169,464
From this reimbursements were allowed:		
On 4,124,242 double centners of raw sugar at 8.50 marks	35,056,057	
On 1,641,518 double centners of candies at 10.65 marks	17,482,167	
On 156,506 double centners of crushed sugar at 10 marks	1,665,060	
		54,103,284
		9,066,180
Deducting managing expenses at 4 per cent		2,526,779
Net receipts from the material tax		6,539,401
Net receipts from the consumption tax		40,759,280
Total income		47,298,683

1889–'90.

98,250,394 double centners of raw beets at 80 pfennigs		78,600,315
The reimbursements were:		
On 4,938,309 double centners of raw sugar at 8.50 marks	41,975,627	
On 2,157,366 double centners of candies at 10.65 marks	22,975,948	
On 94,917 double centners of crushed sugar at 10 marks	949,170	
		65,900,745
		12,699,570
Managing expenses at 4 per cent		3,144,011
Net receipts from the material tax		9,555,557
Net receipts from the consumption tax		50,814,291
Total income		60,369,848

The present bounty or profit accruing to the manufacturers is conceded to be about 2.12 marks per 100 kilograms. During the last year it is estimated that the Government suffered a net loss of 16,000,000 marks.

PROJECTED CORRECTIVE LEGISLATION.

To correct permanently this condition of affairs the Reichstag has now under consideration a measure which proposes to abolish altogether the old material tax, or weight duty, and with it the system of rebates. The consumption tax is increased to an amount which is considered equivalent to the present weight and consumption duty. Though the rebate is withdrawn, all sugar intended for export is exempt. During the year 1889-'90 about 4,400,000 double centners of sugar entered into the home consumption. This is considered as a normal yearly consumption in the German sugar-taxing districts. Without regard to the natural increase of the population or the increase of consumption per head, it is believed that an average yearly consumption of 4,500,000 double centners can be reckoned upon in the near future. This amount of sugar, taxed at 22 marks per double centner, would give an annual return of about 99,000,000 marks, which, after deducting the necessary collecting expenses, would leave to the imperial treasury a clear total of about 95,000,000 marks, as against about 60,000,000 marks under the present arrangement. Such a showing, it is argued, could not be brought about by adhering to the present system.

ARGUMENT FOR AND AGAINST THE NEW METHOD OF TAXATION.

In support of this innovation it is urged that the expenses of the Empire have increased to a very great degree during the past few years, and that it can be predicted with certainty that they will continue to increase. This is due, first of all and chiefly, to the enormous military outlay for the improvement of the national defenses. As secondary causes, the new pension insurance law and the increases granted to the various states for their own purposes are mentioned. The present income is inadequate to meet these growing demands, and other and more profitable sources of taxation must be found. The proposed law does not contemplate any added burden, but simply the doing away of the bounty as such.

On the other hand, the combined sugar interest is unanimous in strenuous opposition to the new measure. It is maintained that the present duty is indispensable to a successful competition with foreign producers, notably the French, who are at present receiving decided government encouragement. It is pointed out that the French premium amounts to 7.50 francs for every 100 kilograms, the Austrian to 3.20 marks, and the German only to 2.12 marks. This, in United States currency, would be as $1.45, 75 cents, and 50 cents, respectively. Moreover, the Austrians have the additional advantage of buying at paper and selling at gold value. The complaint is also made that during the last year German sugar was constantly underbid in the London market by French and Belgian sellers.

If this condition of things actually exists, it will deal a severe blow to the German export trade, which is estimated, in round numbers, to

equal three-fifths of the entire production. Of this, England takes at good share. Out of 601,681 tons of sugar, molasses, and sirup exported in 1888, England received 274,277 tons. This is about five and a half times the quantity sent to any other one country.

The United States, according to the German official figures, received a relatively small amount. It is to be said, however, that this amount has been rapidly increasing of late; indeed, the increase during this last year was the most striking feature of our sugar importation. It was nearly three times as much as the year previous and made Germany second only to Cuba as our source of supply. The value of the sugar received by the United States from the most important sugar centers for the fiscal year ending June 30, 1890, was as follows:

Country.	Value.	Percentage.	Country.	Value.	Percentage.
Cuba	$39,099,670	38.61	Porto Rico	3,681,247	3.81
Germany	16,098,224	15.90	Dutch East Indies	2,722,320	2.69
Hawaiian Islands	11,559,142	11.42	San Domingo	1,715,460	1.70
British West Indies	8,910,130	8.80	Brazil	1,659,251	1.64
Philippine Islands	6,817,866	6.73	Austria-Hungary	1,578,494	1.56
British Guiana	4,325,370	4.27			

The value of the sugar exported by Germany to the United States in 1887-'88 and in 1888-'89 was $1,321,516 and $5,814,407, respectively.

Aside from the alarm expressed by the exporters for the security of foreign trade, there is the cry of the manufacturers that the abolishing of the material tax will disastrously affect the quality of the beets. Attention is called to the French experience. It is further claimed that the burden of the new law will fall most heavily upon the agricultural and laboring classes. In order to compete at all under the new conditions, the cost of production must be lowered. Therefore the farmer will have to accept a lower scale of prices for his beets and the wage-earner for his wages.

RECENT FRENCH LEGISLATION AND THE M'KINLEY BILL.

It is interesting to note, in connection with this agitation, a recent petition forwarded to Chancellor von Caprivi in the name of the Association for the Beet-Root Sugar Industry of the German Empire. It bears the date of November 7, 1890. After reciting the objections which have already been alluded to in this report, it proceeds to consider two other dangers which have lately arisen. One is the hostile French legislation of July and August of the present year, the other is the McKinley bill. By the former the duty on all foreign sugar is raised and German molasses is shut out altogether from the French markets. As to the recent tariff legislation in the United States, the prediction is made that, under the bounty system and with the aid of improved machinery, Florida and Louisiana will be able to produce nearly 500,000 tons of sugar. Moreover, the fear is expressed that what is known as the reci-

procity clause may work serious harm to the German sugar interests. In the language of the petition, this "falls all the harder upon our manufacturers, because under former laws they had always reckoned upon a good market in the United States. The recent interest taken in the United States in the growing of the beet root is another disquieting feature. The report continues:

It is not doubted that a country with such enormous plains can cultivate beets. Even in Germany, with the light of our present experience, we are not now so particular as regards the soil and climate for beet cultivation.

CONCLUSION.

What effect this opposition will have upon the Reichstag is not yet apparent. The whole course of legislation of late years, though, leaves no doubt that the Government is in earnest in its endeavor to suppress premiums. It is safe to predict that such suppression can not be much longer delayed.

Several tables are here annexed. In Table A it is instructive to note that, while the quantity of beets annually worked up is now triple the amount so employed in 1871–'72, the number of factories has only slightly increased, showing a great increase of capacity, due, in a large measure, to the substitution of the diffusion process. The apparent discrepancy in the amount of income received into the imperial treasury, as shown in Table B and as elsewhere given for the last five years, may be explained by the fact that Table B takes into account the amount of duty received from imported sugar and the rebate afterwards granted.

TABLE A.—*Production and use of beets.*

Year.	Number of factories in operation.	Quantity of beets used.	Raw sugar of all sorts.	Molasses.	Quantity of raw sugar extracted from 100 kilograms of taxed beets.
		Tons.	*Tons.*	*Tons.*	*Kilograms.*
1871–'72	311	2, 250, 918	186, 422	63, 892	8. 28
1872–'73	324	3, 181, 551	262, 551	91, 589	8. 25
1873–'74	337	3, 528, 764	291, 041	105, 818	8. 25
1874–'75	333	2, 756, 745	256, 412	97, 603	9. 30
1875–'76	332	4, 161, 284	358, 048	133, 952	8. 60
1876–'77	328	3, 550, 037	289, 423	111, 101	8. 15
1877–'78	329	4, 090, 968	378, 009	122, 813	9. 24
1878–'79	324	4, 628, 748	426, 155	133, 652	9. 21
1879–'80	328	4, 805, 262	409, 415	131, 371	8. 52
1880–'81	333	6, 322, 203	555, 915	164, 984	8. 79
1881–'82	343	6, 271, 948	599, 722	150, 813	9. 56
1882–'83	358	8, 747, 154	831, 995	196, 305	9. 51
1883–'84	376	8, 918, 130	940, 109	207, 978	10. 54
1884–'85	408	10, 402, 688	1, 123, 030	259, 700	10. 79
1885–'86	399	7, 070, 317	808, 105	180, 178	11. 43
1886–'87	401	8, 306, 671	985, 628	215, 887	11. 87
1887–'88	391	9, 963, 961	910, 698	183, 037	13. 08
1888–'89	396	7, 896, 183	944, 505	201, 189	11. 96

TABLE A.—*Production and use of beets*—Continued.

Year.	Beets required to produce 1 kilogram of raw sugar.	Beets raised by factory-owners.	Beets cultivated by factory-owners.	Quantity produced per hectare.
	Kilograms.	*Tons.*	*Hectares.*	*100 kilos.*
1871-'72	12.07	1,504,351	73,690	204
1872-'73	12.12	2,101,301	82,590	254
1873-'74	12.12	2,420,909	88,877	273
1874-'75	10.75	1,908,095	92,655	206
1875-'76	11.62	2,836,307	96,724	293
1876-'77	12.27	2,490,154	98,725	252
1877-'78	10.82	2,872,775	104,783	274
1878-'79	10.86	3,114,030	107,679	289
1879-'80	11.74	2,850,586	113,003	252
1880-'81	11.37	3,871,679	118,431	327
1881-'82	10.46	3,431,754	121,256	283
1882-'83	10.51	4,448,632	129,262	344
1883-'84	9.49	4,205,064	140,843	299
1884-'85	9.26	4,936,246	150,077	329
1885-'86	8.75	4,199,047	138,869	302
1886-'87	8.43	4,486,084	147,782	306
1887-'88	7.65	3,797,652	143,853	264
1888-'89	8.86	4,209,942	149,411	282

TABLE B.—*Taxes and rebates in the German customs territory.*

Year.	Total receipts, including amount from import duty.	Tax rebates.	Net receipts.	Per head of population.
	Marks.	*Marks.*	*Marks.*	*Marks.*
1844-'45 to 1849-'50	20,457,800	2,578,400	17,879,400	0.61
1850-'51 to 1855	21,119,600	2,212,900	18,906,700	0.57
1856 to 1860	27,374,300	1,368,900	26,005,400	0.78
1861 to 1865	32,708,800	864,200	31,844,600	0.90
1866 to 1870	39,537,400	4,198,500	35,338,900	0.94
1871-'72 to 1875-'76	58,872,500	4,159,000	54,713,500	1.32
1876-'77	60,154,500	11,618,200	48,536,300	1.13
1877-'78	67,824,600	18,009,100	49,815,500	1.15
1878-'79	76,171,800	25,627,100	50,544,700	1.15
1879-'80	78,605,000	24,399,500	54,205,500	1.22
1880-'81	102,645,000	56,496,500	46,148,500	1.12
1881-'82	101,869,200	44,992,200	56,877,000	1.26
1882-'83	141,684,600	74,397,700	67,286,900	1.49
1883-'84	144,090,600	96,302,300	47,788,300	1.05
1884-'85	167,821,600	128,452,700	39,368,900	0.86
1885-'86	114,559,800	90,067,600	24,492,200	0.53
1886-'87	142,445,200	108,821,000	33,624,200	0.73
1887-'88	120,245,300	105,568,000	14,677,300	0.31
1888-'89	110,171,100	80,076,100	30,095,000	0.62

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UNITED STATES COMMERCIAL AGENCY,
Madgeburg, December 27, 1890.

THE SUGAR INDUSTRY.

TRANSLATED AND FORWARDED BY CONSUL-GENERAL EDWARDS, OF BERLIN.

National economists have heretofore never attempted to follow a world industry so far as possible through all lands in which it has obtained a footing, everywhere inquiring how it originated, how, under the influence of the requirements of natural production, it has developed, how it has been helped or hindered by legislative measures, how the social and political conditions of the country have influenced its extension, etc. In times like the present, in which trade and industry expand more and more beyond political frontiers, it becomes day by day more difficult to keep in view the home industry competing in the world's market. Hence it appears how easily false conclusions and erroneous conceptions concerning the condition of a great industry may arise and how governmental and legislative measures may exercise disastrous influences.

For this reason the attempt of Dr. Hermann Paasche, professor of political economy at the University of Marburg, to place side by side historical sketches of the development of the sugar industry in all countries of the world is of practical value.

The sugar industry is certainly worthy and deserving of such treatment at the hands of national economists.

It is a world industry in the true sense of the term; it is affected by a very great variety of influences; its powers of vitality and growth often depend upon the system of taxation which obtains, and, in the central European states, it exerts an intense influence upon agriculture.

As Professor Paasche says in the preface to his book (Sugar Industry and Sugar Trade of the World, published by Gustav Fischer, in Jena), in recent years the development of the sugar industry has become of special interest in theory and practice.

By temporary overproduction, by the accidents of trade, and, above all, on account of a series of legislative measures in the chief producing districts of the continent, a few years ago the sugar-fabrication industry was brought almost to the brink of ruin.

Suddenly and unexpectedly a crisis of such threatening character overtook this industry that even the most hopeful optimists wavered and complaints were heard from all beet-sugar-producing countries as well as from the tropical colonies. Never has the fight for existence between beet and cane sugar been so fierce and energetic as within the past few years, and the governments of France, Russia, Austria-Hungary, etc., as well as those of the colonial states, have exerted themselves to support and strengthen their industries in this battle for existence by means of internal-tax and customs-tariff expedients of many sorts. Unfortunately all these measures have exerted a bad influence upon the state of affairs by protracting and directly imbittering the crisis. The years of the most recent development of the sugar industry, therefore, as well as of the agitation for reform in the matter of sugar taxation and customs legislation, are of great interest to the economist and financier. They give a clear insight into a great world industry, in the continual struggle of competition, developing itself further under the pressure of "hard times;" an insight into the deep influence exerted upon it by State legislation, and they show how little foundation plausible theories have in such changeable conditions.

In a most conscientious way Professor Paasche proceeds to investigate the development of the sugar industry in its many homes. In this examination the German industry is entitled to the first place, because both in technical and agricultural development and in the amounts produced it stands first.

In 50 years the German sugar industry has made such forward strides that instead of 17 only 7.99 metre-centners of beets now produce 1 metre-centner of sugar, and that the 2.077 metre-centners of beets, which in the campaign of 1836–'37 were used during the entire season, on the average, by one factory, in many factories now would not suffice for a single day's work. The entire beet-sugar production of Europe in 1889–'90 was 3,520,000 tons, of which Germany supplied 1,260,000 tons, or more than one-third. The growth to this degree of productiveness is very carefully followed by Professor Paasche, in a manner indicative of his mastery of the subject and of the statistical, legislative, and political-economical material pertaining thereto.

The work contains much practical and valuable material and is particularly useful as giving detailed facts in regard to the sugar districts which compete with the German beet-sugar industry, and also in regard to cane-sugar-producing regions. The author has done the beet-sugar industry an especially valuable service by presenting in convenient form facts formerly very difficult of access in regard to the existence and development conditions of the cane-sugar industry.

The value of this work is doubled for the German beet-sugar industry by its appearance exactly at this time, when legislative reform of the sugar-tax system is being discussed in official circles.

PROGRESS OF THE SUGAR-BEET INDUSTRY.

REPORT BY COMMERCIAL AGENT WASHBURN, OF MAGDEBURG.

THE GERMAN INDUSTRY.

Introduction.—Recently published statistics touching the sugar-beet industry in Germany show no abatement in the steady progress which is one of its distinguishing features. The much-discussed law abolishing the bounty system, to which I had the honor to call attention in an earlier report, lately passed the Reichstag after a long debate. Very naturally this threatened change called forth some months ago a storm of vigorous protests, and incidentally it was made the text for a seemingly serious and despondent disquisition upon the future of the German sugar-beet industry. The fact that several other countries, notably France and Austria, are already enjoying larger bounties, the rapidly spreading cultivation of the beet in all temperate belts, and our new tariff bill were among the enumerated causes of the decadence in Germany. It is possible that the authors of these articles were sin-

cere in their visions of impending ruin, but the simple truth is that the German, through years of accurate and scientific experiments, leads the world in the cultivation of the beet and the manufacture of it into sugar. That best of teachers—experience—has taught him every phase of the question presented to him for economic solution. While therefore he may have his regrets at the inevitable doing away of a system, which, it can not be gainsaid, has been a prime factor in the present advanced development of the beet industry, he yet has not the slightest intention of yielding up his hard-earned vantage to anybody else. He understands perfectly well his strength, and, understanding, will use it to keep right where he is—certainly for some years to come.

New legislation.—The new law was passed May 9 by a vote of 159 to 126. In view of the very determined opposition to any change in the form of taxation, a modification of the original draft of the new measure was to have been expected, and this is what happened. It is to be borne in mind that there are two methods of taxation prevailing in Germany—the material or weight tax on the beet roots, and the consumption tax levied on the sugar itself when it enters into home consumption. Since 1861 a drawback has been granted on the material tax when the sugar was exported, and this has operated as a concealed bounty. Under the new law, after August 1, 1892, the material tax is to be abolished altogether and a consumption tax substituted of 18 marks* per metric hundredweight.† As an offset to the doing away of the old method, an open export bounty is to be granted for 5 years. For the first 3 years the scale will be 1.25 marks per metric hundredweight of raw sugar, and 2 marks and 1.65 marks for refined sugar; for the last 2 years the bounty given will be 1 mark, 1.75 marks and 1.40 marks respectively. At present the concealed bounty is supposed to be about 2.25 marks per metric hundredweight of raw sugar.

Outlook.—Some time before the present season opened, information from the most trustworthy sources pointed to an increase in the acreage this year of 5 per cent. Later developments have confirmed this estimate. This growth is likely to be maintained and is the natural outcome of the moderately satisfactory price of sugar of late, the fine yield of the beet root during the past 2 years, and the erection of new factories. It is quite true that the legislation just passed comes too late to affect the present campaign, but it is equally true that no steps would have been taken looking to a permanent enlargement of the industry if there had been any question as to the disastrous effects of a law whose passage has been long foreseen.

Over and beyond the first estimated increase for this year, there will be a further extension in the acreage given to the beet root, due to a cause accidental and temporary. This has been the state of the weather. During March and April frequent frosts and falls of snow and heavy

* One mark = 23.8 cents. † One metric hundredweight = 220.5 pounds.

rains and inundations in the Rhine district made sowing impossible. Labor was confined to the preliminary and rougher work—manuring and plowing. The drilling of the beet kernels consequently took place later than usual. What was more serious, though, in many places the moisture of the ground prevented the sowing of the wheat crop until the season was too far advanced. The result was that a very considerable number of intended wheat fields were at the last moment turned into beet fields. Of course, the final yield may bear no proportion to the area cultivated. Much must always depend upon the quality of seeds selected and the care taken in cultivation, but after this the success or failure of a season's crop is merely a question of favorable or unfavorable weather.

Some newly tabulated statistics are here given:

Cultivation and yield.

Year.	Beet area.	Average yield per hectare.	Year.	Beet area.	Average yield per hectare.
	Hectares.	*Met. cwt.*		*Hectares.*	*Met. cwt.*
1889-'90	298,560	329	1884-'85	316,191	329
1888-'89	280,361	282	1883-'84	298,271	299
1887-'88	263,786	264	1882-'83	254,278	344
1886-'87	276,889	300	1881-'82	221,624	283
1885-'86	234,116	302	1880-'81	193,339	327

1 hectare=2.471 acres.

In Germany very many beets are grown by the manufacturers themselves. The purchased roots moreover are generally grown by contract and under special instructions furnished by the manufacturers. The proportion during the past ten years has been:

Year.	Grown by manufacturers.	Purchased.	Year.	Grown by manufacturers.	Purchased.
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*
1889-'90	51.8	48.2	1884-'85	47.5	52.5
1888-'89	53.3	46.7	1883-'84	47.2	52.8
1887-'88	54.5	45.5	1882-'83	50.9	49.1
1886-'87	53.4	46.6	1881-'82	54.7	45.3
1885-'86	59.4	40.6	1880-'81	61.2	38.8

Year.	Active factories.	Beets worked up.	Beets required for 1 met. cwt. of raw sugar, not including sugar extracted from molasses.
		Met. cwt.	*Met. cwt.*
1889-'90	401	98,226,352	8.09
1888-'89	396	78,961,830	8.36
1887-'88	391	69,639,606	7.62
1886-'87	401	83,066,712	8.49
1885-'86	399	70,703,168	8.75
1884-'85	408	104,026,883	9.26
1883-'84	376	89,181,303	9.49
1882-'83	358	87,471,537	10.51
1881-'82	343	62,719,479	10.46
1880-'81	333	64,222,030	11.37

Cultivation and yield—Continued.

Year.	Raw sugar obtained per hectare.	Working days.	Production, raw and refined, reckoning from September to August.
	Met. cwt.		*Tons.*
1889–'90	42.31	95.3	1,264,607
1888–'89	35.29	84.3	990,604
1887–'88	36.41	76.6	958,353
1886–'87	36.54	90.5	1,012,968
1885–'86	35.82	82.3	838,131
1884–'85	36.52	119.3	1,154,816
1883–'84	31.51	119.4	986,403
1882–'83	32.73	132.4	848,124
1881–'82	27.05	111.2	644,780
1880–'81	28.76	123.9	594,223

GENERAL EUROPEAN OUTLOOK.

The same generally satisfactory and prosperous condition of the beet industry is noticeable throughout Europe. Reports show that in many countries early sowing was prevented, as in Germany, by unfavorable weather. The most reliable estimates indicate that there will be an increase of acreage in France of from 12 to 15 per cent., probably the latter figure; in Austria, of from 8 to 10 per cent.; in Belgium, of 15 per cent. In Holland and Russia the reports are conflicting and not very encouraging. The increase throughout Europe is likely to be about 7 per cent.

The sugar production of Europe, including the cane sugar of Madeira and Spain, during the past 10 years has been as follows:

	Tons.		Tons.
1889–'90	3,627,967	1884–'85	2,672,883
1888–'89	2,783,844	1883–'84	2,430,813
1887–'88	2,481,950	1882–'83	2,157,034
1886–'87	2,750,206	1881–'82	1,915,974
1885–'86	2,239,973	1880–'81	1,814,545

Statement showing the beet-sugar production by countries, including estimate for the current year.

Country.	1890–'91.	1889–'90.	1888–'89.	1887–'88.	1886–'87.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Germany	1,335,000	1,264,607	990,604	959,156	1,012,968
Austria	760,000	753,078	523,242	428,616	523,059
France	700,000	787,989	466,767	392,824	485,739
Russia	530,000	456,711	526,387	441,342	487,460
Belgium	200,000	221,480	145,804	140,742	135,755
Holland	65,000	35,813	46,040	39,280	36,098
Other countries	80,000	80,000	87,000	79,980	69,127
Total	3,670,000	3,619,678	2,785,814	2,481,950	2,750,206

The total sugar production, beet and cane, for the same period is set down at:

	1890–'91.	1889–'90.	1888–'89.	1887–'88.	1886–'87.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Beet sugar	3,670,000	3,619,678	2,785,844	2,481,950	2,750,206
Cane sugar	2,385,000	2,049,464	2,318,708	2,501,735	2,371,221
Total	6,055,000	5,669,142	5,104,552	4,983,685	5,121,427

ALBERT H. WASHBURN,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Magdeburg, June 9, 1891.

RUSSIA.

RUSSIA—1872.

REPORT BY CONSUL SMITH, OF ODESSA.

The great industry of South Russia is agriculture, which, the past year, has been very successful, as shown by the exportations from Odessa and other ports.

The beet-sugar industry, protected by high tariffs, has grown very much these last years, the product having become ample for the wants of the people, and prices reduced to eight, ten, and twelve kopecks the pound, according to quality. This is nearly as low as sugar could be imported if duty free.

Last fall the Government, satisfied that great profits were derived by the manufacturers, determined to lay a heavy excise on it for revenue. At about the same time, however, it turned out that the beet crop was deceptive or deficient, so that the product was considerably diminished and prices accordingly mounted up, so that foreign sugar could be imported and sold in competition, notwithstanding the high tariff.

It is now feared by some that the sugar industry may be discouraged, if not destroyed. The general prosperity and progress of the country continue.

T. C. SMITH,
Consul.

UNITED STATES CONSULATE,
Odessa, May 4, 1872.

RUSSIA—1875.

REPORT BY CONSUL RAWICZ, OF WARSAW.

The cultivation of beet root for the manufacture of sugar has of late years received an immense development in Poland and the adjoining provinces of Bothnia, and particularly that of Podolia.

As early as 1812 the Government endeavored to introduce this manufacture into Poland, by offering loans and promising freedom from conscription to persons employed in it. These means did not, however, meet with success, the first factory having been established only in 1831, and the first refinery in 1839. Since that time this manufacture has received a great development, as there are at present, according to the last official returns, 38 factories, employing 11,389 workmen, the value of produce being estimated at 9,379,669 rubles. The average prices of sugar in 1873 were: Refined, 4 rubles 65 kopecks; farina, 3 rubles 30 kopecks, per stone of 24 pounds. The conversion of beet root into sugar is entirely performed from the end of September to the commencement of April in each year, beyond which time the beet root, if kept, becomes deteriorated.

JOSEPH RAWICZ,
Consul.

UNITED STATES CONSULATE,
Warsaw, October 1, 1875.

RUSSIA—1877.

REPORT BY CONSUL DYER, OF ODESSA.

Industries of every nature are in a languishing condition. Some of the largest establishments at Odessa have during the year gone into liquidation and many others are upon the verge of bankruptcy.

The industry in which the largest amount of capital is engaged is in the manufacture of sugar from the beet root. At the end of 1875 there had been a crisis in this business, and the early months of 1876 brought failures of such establishments in all directions. The withdrawal of the duty on exported sugar gave for a time some relief, but toward the end of the year failures seemed almost epidemic from the Baltic to the Black Sea. At the recent convention of persons interested in this business at Kief, it was discovered that but two of all the companies represented had been able to pay a dividend. With most of them it was simply a question of being able to continue their operations. The production of the root is said to very rapidly exhaust the soil, while the destruction of the forests for purposes of fuel for steam is an item that might well be considered, in view of the scarcity of timber in all South Russia.

L. E. DYER, *Consul.*

UNITED STATES CONSULATE,
Odessa, October, 1877.

RUSSIA—1881.

REPORT BY CONSUL-GENERAL STANTON, OF ST. PETERSBURG.

Governments.	No.	Quantity.	Value.	Laborers.	Insured value.	Excise.
		Tons.				
Kief	65	84,384	$10,990,865	24,011	$12,322,500	$575,156
Podolien	50	44,347	4,978,585	15,946	8,403,100	383,654
Charkoff	21	*23,195	*2,577,750	8,243	2,658,750	182,3[illegible]0
Tshernigoff	14	4,629	585,440	5,187	1,062,100	73,499
Kursk	12	*13,695	*1,525,815	4,925	1,672,500	110,015
Volhynien	11	12,254	1,525,315	5,175	2,786,300	90,673
Voronesh	7	2,455	338,245	1,969	482,500	29,287
Tamboff	5	2,962	425,926	1,475		34,695
Tula	3	8,018	480,700	1,440		39,300
Poltava	2	801	97,150	538		8,924
Penza	2	440	95,246	375	1,429,000	4,431
Bessarabia	1	504	60,200	580		4,728
Orel	1	203	27,120	170		4,375
Mohileff	1	145	28,236	190		2,168
Minsk	1	*43	*4,780	88		345
Total Russia	196	193,075	23,740,872	70,312	30,816,750	1,543,636
Warsaw	19	*14,551	*2,182,500	*[1]1,708	1,900,000	183,268
Kalish	5	*2,206	*275,753	*[2]388	500,000	27,870
Lyublin	4	1,994	285,700	1,595	615,950	24,054
Radom	3	1,277	184,596	617		17,544
Kyeltzl	2	1,186	155,184	*[3]384		17,748
Peterkoff	2	*1,114	*139,394	131	1,418,050	15,535
Lomsha	2	652	85,135	250		5,950
Plotsk	2	1,258	139,750	550		15,634
Syedletz	1	*462	*51,340	*[4]84		5,817
Total Poland	40	24,700	3,499,352	*[5]5,707	4,434,000	313,620
Grand total	236	217,775	27,240,224	*[6]76,019	35,250,750	1,857,250

* Calculated on the estimated capacity of works.

[1] Actually in 1879–'80, 9,683. [2] Actually in 1879–'80, 1,552. [3] Actually in 1879–'80, 685. [4] Actually in 1879–'80, 380. [5] Actually in 1880–'81, 22,879. [6] Actually in 1880–'81, 98,190.

From the foregoing table it will be seen that during the season of 1880–'81 there were in operation in all Russia 236 sugar works, 196 being in Russian and 40 in Polish governments.

It has hitherto been the practice of the Russian Imperial Government to estimate, from existing data, the capacity of a sugar mill and to collect the excise duty on the estimated—without regard to the actual—production.

According to this established rule there were 83,846 tons (4,658,146 poods) of sugar produced, viz, 69,824 tons (3,879,129 poods) in the Russian and 14,022 tons (779,026 poods) in the Polish governments. The excise duty collected amounted to $1,857,250.

In consequence of the introduction of more perfect apparatus the actual exceeds by far the estimated production.

Thus in the Russian the relation of the established standard to the actual production was as 1 to 2.7664 and in the Polish government as 1 to 17.653, so that the actual production of sugar was 217,861 tons (12,103,415 poods), the Russian Government producing 193,163 tons (10,731,295 poods) and the Polish 24,698 tons (1,372,120 poods).

The value of the production was $27,236,690, viz, $23,737,286 for the Russian and $3,499,208 for the Polish works.

This great difference between the estimated and the actual produc-

tion has called forth a decree whereby the excise duty is henceforth to be collected on the actual production, at first at a less, later at an increased rate. It is believed that this change of system, which has already increased the price of sugar, will treble the government's receipts.

The buildings and machinery of Russia's beet-root-sugar manufactories are insured for $35,250,750 (of which $30,816,750 are on Russian and $4,434,000 on Polish mills), which is an evidence of the magnitude of this branch of industry.

There were 93,190 laborers of both sexes employed, viz, 70,312 in the Russian and 22,879 in the Polish works.

Many mills are largely engaged in cultivating the beet root, whilst others depend entirely on others for their raw material.

In the Russian Governments the manufacturers cultivated themselves 240,967 acres of beet root, which yielded 1,327,697 tons—7,376,098 berkovets—being an average yield per acre of 5.5 tons. Besides their own production the manufacturers purchased 1,105,947 tons for $3,763,892, the average price per ton being $3.43.

Assuming that the other producers obtained an equal average yield with the factories they would have cultivated 201,560 acres, with a return per acre of $18.86, to which should be added the value of the leaves and pressed roots returned by most of the factories.

From this will be seen how great is the agricultural importance of the beet-root-sugar trade in Russia, to which, in fact, many of the provinces owe their prosperity exclusively. Altogether there were 442,527 acres devoted to the culture of the beet root. About 34½ per cent. of the mills are the property of stock companies.

EDGAR STANTON,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
St. Petersburg, February 2, 1882.

RUSSIA—1883-'84.

REPORT BY ACTING CONSUL-GENERAL SWANN, OF ST. PETERSBURG.

This industry is mostly confined to limited areas in the southwestern, Little Russian, and Prevestland provinces of the Empire, and from the total number of sugar works in successful operation during the year 1883 the distribution was as follows:

In the southwestern provinces there were 128 establishments in operation, of which the greater number (68) were in the government of Kieff, and 49 in Podolsk; in Little Russia 38; in the government of Kharkoff 22, and in the Prevestland provinces 42. In nine other governments 38 establishments were in active operation, of which latter number 14 were in the government of Koursk.

The beet-root plantations under cultivation in 1883—and in connection with this sugar industry—equaled 735,000 acres, being an excess of 102,051 acres over the area under cultivation in 1882. Of this total 302,942 acres belonged to the sugar companies, and 432,058 acres to planters.

During the year 1883 the sugar works consumed 22,473,096 berkovets of beets (1 berkovet Russian equals 360 English pounds), of which quantity 22,172,777 berkovets were accounted for as follows:

Sugar works located in—	1883.	1882.
	Berkovets.	*Berkovets.*
Southwest governments	12,511,451	*663,716
Prevostland provinces	3,516,996	*972,365
Other governments	6,484,649	†888,651

* Decrease. † Increase.

Results obtained from these operations were as follows, given in poods (1 pood equals 36 pounds English):

	Poods.
Best sugars	1,553,295
White and moist	14,422,554
Yellow moist	9,306
Refined molasses	1,249

Being an excess of 894,104 poods over the workings of the former year 1882, although in the manufacture of best sugar there was a decrease in the output of 528,916 poods as compared with 1882.

From the total quantities of best refined sugars and lower grades, the manufacture has been distributed as follows for 1883:

REFINED BEST.	Poods.	LOWER GRADES.	Poods.
Warsaw	717,426	Kieff	4,991,283
Keiff	264,176	Podolsk	2,924,499
Podolsk	252,179	Kharkoff	2,230,281

The total number of employés engaged in the sugar industry at the manufactories, exclusive of beet-root cultivation, was, in 1883, 94,580 persons; of which number 73,334 were male laborers, 13,869 were female laborers, and 7,377 were children.

Notwithstanding low prices in connection with this industry, the trade returns during the past year 1884 have been satisfactory, the exports being as follows:

Refined sugars.	1884.	1883.
	Poods.	*Poods.*
Baltic Sea exports	4,830	....
Black and Azoff Sea exports	28,990	8,091
Land transit	39	22
	33,859	8,113

The profits derived by the companies engaged in this industry are not so great for the year 1884 as in 1883, and in the greater number of instances the profits and bonuses at the disposal of the shareholders in the sugar undertakings of Russia were much diminished, as will be seen from the following details collected from the Kierlanui, a journal devoted to this industry.

The dividends of the sugar refinery Lorodok for the year 1884 was 20 per cent. as compared with 25 per cent. gain in 1883. The refinery Iaropowitch gave 15 per cent. The Kieff Sugar Refining Company declared a dividend of 8 per cent. as compared with 10 per cent. in 1883. The Kalinsky Sugar Works gave a dividend of 20 per cent. as compared with profits exceeding 40 per cent in 1883, and the Romanoffsky Refinery gave 15 per cent. for the late year's working.

Other sugar works and refineries gave results not less satisfactory to their shareholders, though, as already intimated, the dividends were not so great as in 1883.

JAMES V. R. SWANN,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
St. Petersburg, May 12, 1885.

RUSSIA--1886.

REPORT BY CONSUL HEENAN, OF ODESSA.

BOUNTIES.

I submit the few statements this dispatch contains on the subject of sugar in Russia with the intention of calling the attention of the Department in the first place to the enormous quantity produced, and the consequent effect on the price of the article, and in the second place to the action of the Russian Government in coming to the relief of the sugar manufacturers, and the effect of the same on the sugar interests generally.

Russia did not export sugar until last year, except in very small quantities, and then only to neighboring countries, the home consumption heretofore absorbing all that could be raised, the quantity required being between 720,000,000 and 792,000,000 pounds each year.

The producers, who are also the manufacturers of sugar, for years past have been realizing enormous profits from the protection afforded them by the Government in placing a high tariff on all foreign sugar. These profits, according to good authority, have reached as high a figure as 50 per cent., besides increasing the value of the lands from 150 to 200 per cent., owing to the cultivation of the beet.

In consequence of these high profits there was an overproduction of sugar. This was foreseen early in 1835, a surplus of between 288,000,000 and 360,000,000 pounds being the result. This surplus caused prices to

drop to the low price of 5 cents per pound. The wealthy owners at once appealed to the Government for aid to keep up, not their industries, because it was shown that even at this low figure a moderate profit would result, but to keep up their large profits.

The Government yielded to this demand, and gave a premium or bounty of 1 ruble per pood, or 50 cents on every 36 pounds of sugar exported, until 72,000,000 pounds should be reached. As this quantity was not sufficient to relieve the market of its surplus, free permit was given for sugar exported, with a premium or bounty of 40 cents on every 36 pounds exported until May 1, 1886 (Russian calendar).

The quantity exported thus far (April 8) is about 216,000,000 pounds, so that from 72,000,000 to 144,000,000 pounds remain to be disposed of.

The greater part of the sugar exported was sent to England. It was not sold, but was consigned, and still remains unsold on the English market, which is depressed by the supply pouring in from all countries.

The bounty allowed by the Russian Government was not sufficient to induce the owners of the surplus sugar here to part with their stock. They have therefore applied to the Government for an increase of this bounty, with the additional request that the bounty be paid in the future on all sugar exported, and that the manufacturers be not asked to return the bounty already paid.

The Government levies a tax of 65 kopecks on every pood of manufactured sugar, or 32½ cents on 36 pounds.

The bounty allowed was to be refunded by increased taxation (internal revenue) on future crops.

This additional demand on the part of the sugar interest was received with great discontent and opposition by the agricultural classes generally, and the question was asked, "Why should not the Government give a bounty to other products which were exported, wheat, for instance, as well as sugar, which had a long run of prosperity?" The other interests of the country objected to paying tribute to increase the profits of the wealthy sugar manufacturers.

The Russian minister of finance refused to grant the request made, and declined to help in any other way toward a reduction of this product, declaring that those people who unreasonably increase production must bear the consequences of their own action.

The minister further replied that the difficult situation of the sugar industry produced by the overproduction during the periods of 1884–'85–'86 has attracted the attention of the Government. By two resolutions of the committee of ministers there was given to the manufacturers of the whole Empire an export premium of, first, 1 ruble, and afterwards 80 kopecks, per pood, and through this measure undoubtedly a collapse of prices was prevented.

However, on the part of the manufacturers, different petitions and appeals have been made, and are still being presented, regarding which the minister of finance sees himself induced to give some explanation.

Some of the applications demand partly an increase and partly a non-refundable premium; others a limitation of production by fixing the amount produced by each manufactory, and extra taxation of the amount exceeded; others again consider all measures superfluous, and expect an amelioration and improvement through the cheapening of production or through the stoppage of work of those factories which are not able to compete.

The minister of finance, therefore, considers it necessary to observe that an increase or a non-refundable export premium is out of the question, and that the premium paid up to now had the purpose to relieve the market of its surplus production for the period of 1885–'86, and must cease in the future, it not being the intention to in any way encourage overproduction.

A continuation of this premium would be purposeless, as the rest of the European States—Germany, France, and Austria—have gone so far in the way of premiums as to make it impossible to compete with them.

The minister of finance intends to protect home production only so far as to supply the home consumption, and not to supply foreign consumers with cheap sugar at the expense of the Russian Government and the Russian people; consequently the minister of finance considers it necessary to inform the sugar interest in advance that the produce of the next season can count upon no premium for export.

Regarding the question of limiting the production, the minister of finance considers it necessary to remark that before all it is the duty of the manufacturers themselves to reduce the production sufficiently for the demand, and that the question is not a matter for Government interference; all consequences of immoderate production must fall on unreasoning producers.

The minister of finance therefore considers it necessary—

1st. To provide for an outlet to some oriental market.

2d. To prevent speculative rise of prices through a lowering of import duties.

3d. To reconsider the arrangement for repayment of premiums.

Regarding the first two points a resolution may be arrived at within a short time, and any further communications on the subject will be useless; but regarding the last point the minister of finance solicits the opinion of parties interested up to May 15, 1886.

The refunding of the premium may be left as heretofore, viz, according to the quantity manufactured, or it may be so allotted as to bring it in proportion to the increased production of certain manufactories.

Petitions only will be received and considered on this latter point; all others which demand favors and assistance, such as abandoning the premium paid on the part of the Government, and also petitions asking for an extension of time on internal-revenue taxes, must not count on favorable consideration.

The grade of this sugar is from 99½ to 100 per cent polarization, all being made from the beet, no cane being used or grown.

The method of refining is not up to the latest improved methods, else the yield per pound of beet would be much larger.

Russia is a high protective-tariff nation, and strongly in favor of and jealously anxious to protect home industries, yet is not willing that the majority of her citizens should suffer in order that a favored few might prosper, a sentiment that will be favorably received in every farming community on this as well as on the other side of the Atlantic.

I venture to hope that the matter contained in this communication may pardon its length.

THOMAS E. HEENAN,
Consul.

UNITED STATES CONSULATE,
Odessa, April 8, 1886.

RUSSIA—1889.

The manufacture of beet-root sugar is yearly increasing in Russia, and the industry is in a flourishing condition. The completion of the Transcaspian Railway opened up an immense field for the sugar interests, and large shipments are constantly being made to Toorkistan, Persia, and the Caspian side of the Caucasus generally. The beet root is largely grown and manufactured into sugar in the governments of Kiev, Podolia, Volhynia, Karkov, Kurtsk, and Veronsk, as well as in some of the more northern districts of Russia.

THOS. E. HEENAN,
Consul.

ODESSA, *March* 26, 1890.

BEET VS. CANE SUGAR PRODUCTION.

REPORT BY CONSUL-GENERAL WILLIAMS, OF HAVANA.

With reference to the inclosed extracts from a few of the dispatches addressed by me to the Department upon the economic state of the island of Cuba since my official connection with this consulate-general in 1875, and as confirmatory of their statements, I now beg to inclose the translation of a paragraph from the Avisada Comercial, of this city, relating to the enormous increase of 800,000 tons in the European beet-sugar crop of this year over that of last year, which sudden increase not only offsets the average annual exportable Cuban crop of some 600,000 tons, but even overshoots it by an excess of 33⅓ per cent.

The general welfare of the inhabitants of this island is so inwrought with their production of sugar, as pointed out by the simile of the labor-

ers A and B in my dispatch No. 724 of August 8, 1878, that I respectfully beg to express the opinion to the Department that the present beet-root sugar crop of Europe, reported at 3,600,000 tons, ought to be a subject of preferred solicitude and consideration on the part of the Government of Spain.

RAMON O. WILLIAMS,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Havana, April 9, 1890.

BEET-ROOT SUGAR.

[Inclosure 1 in Consul-General Williams's report.—Translation from the Avisada Comercial, Havana, April 7, 1890.

The holders of this sweet have been offering it freely during the whole week (in the New York market), but without forcing operations, and it is believed that no sales were made. Owing to the sudden increase in the saccharine richness of the juice from the root in Germany, Mr. Licht (the statistician) has had to raise his estimates of the production of that Empire to 50,000 tons more; and as the total crop of Europe now reaches 3,600,000 tons, there results an increase of 800,000 tons in the present crop of 1889–'90 over that of 1888.

It is therefore not strange that in sight of such a formidable increase of supply the American refiners feel they will be able to cover their needs of raw sugars at their own pleasure and at moderate prices, and therefore show no anxiety to accept present offerings.

BEET-ROOT SUGAR IN 1889–'90.

[Inclosure 2 in Consul-General Williams's report.—Translation from the Boletin Comercial.]

Mr. Licht estimates, in his last bulletin, the beet-root sugar crop for 1889–'90 at the following figures:

Countries.	Tons.	Countries.	Tons.
Germany	1,250,000	Holland	60,000
Austria-Hungary	780,000	Other countries	80,000
France	750,000	Germany, increase, as explained	50,000
Russia	480,000		
Belgium	200,000	Total	3,600,000

NOTE.—In 1888–'89 the total was 2,785,844 tons, and in 1887–'88 it was 2,481,950 tons.

BEET-ROOT SUGAR IN 1875.*

[Inclosure 3 in Consul-General Williams's report.]

The beet-root production during the last year in Europe has reached the enormous amount of 1,100,000 tons of sugar, and the coming crop there, according to the estimates of the best European statisticians, will show another increase of production of

* This and inclosures 4, 5, and 6 are extracts from former reports to the Department by Consul-General Williams.

at least 10 per cent. over that of last year. Should this be realized, then scarcely any market at all will be left in Europe for Cuba and Porto Rico, and, as a consequence, almost their entire crop will be forced for sale into the market of the United States; and, as the amount of supply will determine the price to be paid by the consumer, and not the cost of production, prices must inevitably fall to a lower standard, unless prevented by some unexpected event. In this case some advantages will accrue to the general material interests of the United States as a partial compensation for the injuries inflicted upon our commerce by the action of the differential tariff which reigns here; and, acting like a turbine wheel—receiving the force of impulse at one angle and deflecting it at another—nearly all that reciprocal of trade which should be returned to the United States as the equivalent for the seventy-odd millions of dollars, comprised principally of sugar and molasses sold there by Cuba and Porto Rico, is diverted and imparted by its action to Spain and her dependencies, with its immensity of commercial moving power, for the invigoration and development of their agricultural, industrial, commercial, and maritime interests.

BEET-ROOT SUGAR IN 1878.

[Inclosure 4 in Consul-General Williams's report.]

The following example in domestic economy will illustrate, in some degree, the mode in which these differential duties are, in the wider operation of political economy, eating, cancer-like, into the very vitals of the material prosperity of this island as likewise those of Spain, that of the latter being mostly an effect of the former.

Let it be supposed that the laborers A and B are compelled to go into the labor market to sell their services. They each earn, for instance, $1 per day, and with these earnings they buy the supplies of themselves and families.

The law governing A compels him to buy his bread from a certain baker, and in the same way his meat, groceries, shoes, and clothes from a designated butcher, grocer, shoemaker, and tailor, to each of whom he has to pay, say, 30 per cent. higher for his supplies than the laborer B, because the latter has the right to buy wherever he can get his supplies cheapest. Now, it is clear in this case that, though both laborers earn the same wages, this differential taxation reduces the exchangeable value of a day's labor of A to 70 cents when compared with the day's labor of B, which is worth to him $1 in the purchase of supplies.

Further, and what probably is a still more important effect for the purposes of this analysis, is that B possesses a competitive advantage of 30 per cent. in the labor market over the laborer A.

Now, the same simile holding good when treating of the selling and buying power of a nation, it follows that the exports of Cuba bear the same relation to its economic being as the wages of the laborer A bear to his personal welfare and to that of his family.

Cuba has, from the necessity of self-preservation, to send her exports, consisting mostly of sugars, molasses, tobacco, and cigars, to whatever market will pay her best. She finds the best market for her products in the United States, where she sends about 90 per cent. of her exports.

Now, with her exports out, she buys her imports in, in a similar manner as laborer A with his daily earnings buys his supplies.

But the law governing Cuba subjects her imports to the action of a differential tariff, so constructed as to force her to buy to the furthest possible extent from a certain nation and to employ for the purposes of transportation a designated shipping.

Accordingly, Cuba is pressed to purchase her flour, provisions, groceries, shoes, dry goods, and all other articles of consumption in Spain, and to bring them in Spanish shipping, only buying from other countries when these, despite the discrimination, are able to sell to her cheaper than Spain.

Thus Cuba, like laborer A, suffers a great loss in the exchangeable value of her exports, although getting the same prices for them when compared to the exports of other sugar-producing countries, but who, like laborer B, have the right to buy wherever they can get the cheapest.

In this arrangement we probably find the most glaring example of economic fallacy existing in any country doing an extensive foreign commerce; for, just in proportion as Spain is "protected" at the expense of Cuba, it being an unreciprocal protection, the exchangeable value of Cuba's exports is thereby lessened, as in the case of the services of laborer A, she suffering a corresponding diminishment in the amount of imports purchasable by her exports, just upon the same principle that a given measure shortened at one end is thereby shortened at both ends.

Further, to the extent of the harm done by the operation of these differential duties, so does the competitive power of the beet-root sugar of Europe and the cane sugar of all other countries operate against Cuba in the sugar-consuming markets of the world; and to such a potent degree has this competition risen, through the increase of sugar-production, which, at the same time, is gradually affording the United States, through other channels, that reciprocity of trade diverted from them by the differential tariff of Cuba, that Cuba's sugars are now quite forced out of the markets of Europe, and she is helplessly reduced to the sugar market of the United States, notwithstanding the high import duties there on sugar, to which Cuban planters and high Spanish officials point, believing that they come out of the Cuban producer instead of the American consumer. But, were such the fact, it is surprising that Cuba does not attempt to avoid their payment by the shipment of its sugars to Great Britain, where, at present, no import duties are levied on the article.

It is easy to perceive that the more necessity compels Cuba to gravitate to the United States for a market to sell in and the more Spanish legislation compels her, on the other hand, to go to Spain as a market to buy in, so will her commercial status become abnormal, and in like proportion must the effects in time be disastrous to Cuba and to Spain; for it is impossible for a people to stand when so divided that its commercial necessities are in one direction and its political ties in another directly opposite.

BEET-ROOT SUGAR IN 1878.

[Inclosure 5 in Consul-General Williams's report.]

At a time not far remote, when Cuba, owing to the temporary effects of factitious and accidental causes, made nearly 40 per cent. of the sugar supply of the world, and when her market lay principally in Great Britain and other countries of Europe, where, from motives of interest, no retaliatory duties were imposed on merchandise imported and exported in Spanish shipping, it was, from this relatively dominating position, temporarily feasible for Spain to maintain in Cuba a differential tariff; but, now that her quota of that supply scarcely reaches 18 per cent., and Cuba's market to sell in having changed from Europe to be confined almost exclusively to the United States, where these differential duties are offset by retaliatory duties, it has ceased to be longer beneficially practicable.

For some time past the operation of this differential tariff has been reactive and destructive of the interest and welfare of Cuba, and it now only operates as a "protection" favoring the development of the sugar industry in all other countries just to an extent exactly correlative to the amount of exchangeable value it detracts from Cuba's export in their purchase of her exports.

The Spanish Government is now in the dilemma of either continuing this differential tariff or of abolishing it. If it chooses the first alternative, it will thereby, in a brief series of years, destroy not only the sugar industry of the island, but with it, as secondary effects, all the many interests that derive their moving power from that crop,

such as the railroads, the coastwise shipping, exporting merchants, banks, sugar warehouses, cooperage establishments, wharves, lighters, and depriving of employment its brokers, clerks, mechanics, laborers, stevedores, and rendering, also, valueless to creditors its public debt. The export basis of the island once dissipated, its import business, too, ceases, and then another train of large and small business establishments will simultaneously go out of existence for the want of sugar, out of which staple flows their moving power. Coincidently with the working out of this process, other countries are striving to occupy the position of Cuba as sugar-purveyors to the United States. If, however, Spain would act from a higher standard of thought and with the wisdom and sense of responsibility that ought to be the rule of all governing powers, and abolish this tariff, thereby leaving Cuba with the right to buy wherever she can do so the cheapest, then in that event the great bulk of Cuba's imports must come from the United States, for the simple reason that she can there buy them cheapest, reaping, besides, a great saving of time, because of the proximity of the United States, over bringing them from Spain and other European countries.

As a proof of the capability of the United States to furnish the imports of Cuba to the advantage of its population, we have the practical fact that the dry goods merchants of this city are at the present day importing American calicoes from the United States via Liverpool, England, whence they are brought in Spanish steamships to Havana, with the surcharge of commission, freight, truckage, and marine insurance consequent upon the roundabout way of importing enforced by this differential tariff, instead of bringing them direct from New York or Boston. And this only means that Cuba gets just so much less of imports in exchange for her exports and that other sugar-producing countries are literally "protected" by Spanish legislation just to that extent at the expense of Cuba.

BEET-ROOT SUGAR IN 1886.

[Inclosure 6 in Consul-General Williams' report.]

I inclose a copy of F. O. Licht's monthly report of the beet-root sugar industry of Europe, published at Magdeburg, and dated the 20th of November, 1886, as also, for the like purpose of comparison, an accompanying extract of my dispatch No. 291 of the same date of the year 1875, the interval between the two dates being exactly 11 years.

You will please observe that what I called in 1875 in the said dispatch the enormous amount of 1,100,000 tons of beet-root sugar produced in the year 1874-'75 in Europe will, according to the inclosed report of Mr. Licht, reach the coming year to 2,580,000 tons, which is equivalent to an increase of 134.54 per cent. during the last 11 years.

It is likewise observable that, according to the best statistical data of the exports of Cuba attainable in 1875, the percentage of its sugar crop sent in that year for sale to the United States, as reported in my said dispatch, was 81 per cent., whereas the similar data now attainable, and as stated in my report of the 25th of June ultimo (dispatch No. 427), published in the Consular Reports, show that Cuba has shipped to the United States during the present year 94 per cent. of her sugar and molasses crop, leaving a remainder of only 6 per cent. which was shipped to other countries during the same period.

From these facts several very important economic relations are deducible: (1) With the exception of the very limited sugar market of the Spanish Peninsula, Cuba is completely shut out of the European sugar market, Great Britain, France, Germany, Austria-Hungary, Italy, Russia, Belgium, Holland, Denmark, and Sweden and Norway being no longer consumers of Cuban sugar; (2) that, practically, the island is now entirely dependent upon the market of the United States in which to sell its

sugar-cane products. Also, that the existence of the sugar plantations, the railroads used in transporting their products to the shipping ports of the island, the import and export trades of Cuba based thereon, each including hundreds of minor industries, such as the agricultural and mechanical trades, storehouses, wharves and lighters, stevedores, brokers, clerks, bankers, real-estate-owners, shopkeepers of all kinds, and holders of the public debt, are now all directly related to the market of the United States to the extent of 94 per cent. for the employment, and only 6 per cent. to other countries, of the latter mostly Spain, simply for the reason that sugar is the principal economic basis of all those interests.

It is with the knowledge of this fact of the dependence of Cuba upon the United States to the extent of 94 per cent. for a market in which to sell, added to the apprehension that that market may also be taken by other sugar-producing countries from Cuba, that now leads its inhabitants to urge upon the Madrid Government the immediate negotiation of a treaty of commerce to put the island in a more harmonious relationship with its natural market, the United States.

BEET-ROOT AND CANE SUGAR IN NEW ZEALAND.

REPORT BY CONSUL GRIFFIN, OF AUCKLAND.

The large and steady annual increase in the consumption of sugar in New Zealand has directed very general attention to the various methods for its production in this colony. So much interest was taken in the subject that the Government at the last session of Parliament passed an act for the encouragement of the manufacture of sugar from beet root and sorghum. The act provides—

That the colonial treasurer shall, out of the consolidated fund, pay to the person producing the same, one-half penny (1 cent) per pound on the first 1,000 tons of sugar produced from beet root or sorghum grown in this colony, and, further, that no duty by way of excise or ortherwise shall be levied for 15 years from the 1st day of 1885 on any sugar produced in this colony whilst the present import duty of one-half penny per pound continues; but, if the import duty is increased, then an excise may be levied so long as one-half penny per pound at least remains as the difference of duty charged on sugar imported and sugar produced in the colony from beet root or sorghum grown in the colony, to every person producing the same equal to the duty so removed or reduced, but never exceeding one-half penny per pound.

Much opposition was offered to the bill before it became a law. It was urged that it would crush out the industry of the manufacture of sugar from the cane, already established in the colony, and that the bonds system was simply introducing protection in an insidious form, that it would impose a fresh burden on the people, and that it would lead to every other industry demanding similar legislation in its favor. It was also said that it would result in the squandering of public money and in the ruin of speculative manufacturers who might be induced to erect costly factories and machinery. The people throughout the colony, and especially in the district of Auckland, were strongly in favor of the law.

Mr. William A. Graham, of Hamilton, New Zealand, wrote a very able and interesting pamphlet on the inducements offered for the man-

ufacture of beet-root sugar in the Waikato district, which had extensive circulation in the North Island, and Mr. Pond, the government analyst at Auckland, published the results of a series of experiments he had made with beet roots grown in various parts of Auckland, in which the average yield of sugar was 12.29 per cent., the highest being 15 and the lowest 9.82 per cent. The general circulation given to these papers, together with much other matter on the same subject, appeared to settle the question that beet-root sugar could be produced profitably in New Zealand. Excellent results have been obtained from the cultivation of the sugar beet in the Waikato, where the crop is as much a specialty as the orange or banana is in the extreme north. The absence of salt in the soil and in the atmosphere, caused by its inland position, added to its adaptability to the growth of root crops, gives the district very great advantages over the country near the seacoast, and there is now no doubt that the average yield of sugar in the Waikato beet is greater than that produced in Germany and France.

Mr. Pond's paper is so full of interesting and valuable material and contains the results of so many chemical experiments of a direct, practical character that I had thought to reproduce it here entire, although I feel constrained to express the opinion that the production of sugar from the cane will, in the end, prove more profitable than from the beet root:

ON THE SUGAR VALUES OF BEET ROOT GROWN IN THE WAIKATO.

By I. A. Pond, government analyst for the district of Auckland

During the session of 1880 a paper was read before the New Zealand Institute entitled "On the growth of sugar beet in New Zealand," by Dr. S. M. Curl. In this paper the writer very ably reviewed the subject and placed much valuable data before us; but, when speaking of the values of sugar in the different varieties of beet root examined by him, he claimed to have found as high as 17.5 per cent. This excessive amount, the fact that parliamentary papers had been published giving analysis of New Zealand grown beets showing much less favorable results, and the absence of any details of examination led me to take up this subject with the view of practical operations should the experiments justify it. About this period also, I had interested myself in the matter of sugar beet, owing to some superior seed having been brought from Hamburgh by Mr. G. S. Graham, and, finding it had been distributed amongst some of the Waikato settlers for planting, I undertook the examination of the roots when they should be sufficiently grown. Mr. W. A. Graham, of Tamahere, who had taken a very great interest in the matter, had papers printed according to a plan drawn out by myself, and forwarded to those settlers who had undertaken to grow the roots. These papers were designed to obtain data for the future guidance of a company, should one be formed through any satisfactory results of these experiments, and were divided into columns requesting information, as follows:

Particulars of Waikato beet roots.

From whom forwarded, and name of estate.
Character of soil, and whether drained, etc.
Whether manured or otherwise; if manured, state character of manure.
Whether from imported seeds or from where obtained.
Give approximate of weight to the acre, if possible.

Analytical results. Percentage of beet sugar and notes.

The first installment I received was from Mr. L. O'Neill, Hamilton, and came to hand on the 28th January. There were three roots, grown from seed imported by Mr. Lavers, and resulted as follows: No. 1, weight, 2 pounds 2 ounces; percentage of cane sugar, 10.95. No. 2, weight, 1 pound 2 ounces; percentage of cane sugar, 10.17. No. 3, weight, 12 ounces; percentage of cane sugar, 13.55.

On the 24th February, one month later, Mr. O'Neill again forwarded a parcel of four roots from the same crop. Taking the largest of them, weighing 2 pounds 2 ounces, I found the percentage of sugar to be 14.25; the three others I aggregated with a like percentage of 14.25.

Finally, on the 24th August, I received a parcel of five roots from the same grower, which had been removed from the ground and stored, some of which are on the table. Two of these I have examined with the following results: No. 8, weight, 2 pounds 7 ounces; percentage of sugar, 11.40. No. 9, weight, 2 pounds; percentage of sugar, 14.25.

The further examination of these roots I will speak of again, in relation to the specific gravity of the juice.

On the 18th of February I received three roots from Mr. Ralph, Huntley, marked sugar beet. They were of a full red-colored skin, but I have obtained no knowledge of the name of the seed or where procured. Result of analysis: No. 1, weight, 5 pounds 5 ounces; percentage of sugar, 4.31. No. 2, weight, 12 ounces; percentage of sugar, 7.50. No. 3, weight, 9 ounces; percentage of sugar, 11.87.

This root No. 1 was a well-shaped one, of large proportions, very watery, but with a very low percentage of sugar. This is the lowest result I have obtained, and far below any other. At the same time its excessive size would lead to the conclusion that its value in sugar was low.

One more parcel I received of unknown seed, from Raglan, through Mr. Will, comprising five small roots, badly formed, the largest of which, weighing 1 pound 12 ounces, yielded a percentage of sugar, 8.14.

I now proceed to note the results of the seed obtained by Mr. Graham from Hamburg, and which had been distributed as already noted. There were three kinds in all.

No. 1.—Genuine white small Wanzlebenel imperial.

No. 2.—Deppe's pure white improved Silesian imperial.

No. 3.—Extra saccharine red-top imperial.

In the following notes I will simply call these varieties by their respective numbers, 1, 2, and 3.

On the 10th March I received three roots, one of each variety, from Mr. R. Watson, Pukerimu.

No. 1, weight, 13 ounces; percentage of sugar, 13.57. No. 2, weight, 1 pound 1 ounce, and No. 3 (weight, 12 ounces), I treated in the aggregate, with the result of 15 per cent. of sugar, this being the highest value obtained.

On the 2d of April I received a parcel of five roots from Mr. E. B. Walker, Cambridge, the weights of which were between 1 pound 1 ounce and 1 pound 15 ounces and were of the three varieties, but without anything to distinguish them. These I treated in the aggregate with the result of 13.57 per cent. of sugar. Taking the best proportioned root of the parcel, weight, 1 pound 10 ounces, I found it to contain 15 per cent. of sugar.

On the 10th August I received samples of the three kinds of root already named from Mr. T. Goodfellow, Alexandria, which gave the following results: No. 1, weight, 1¼ pounds; percentage of sugar, 12.66. No. 2, weight, 1¼ pounds; percentage of sugar, 11.40. No. 3, weight, 2¾ pounds; percentage of sugar, 9.82.

These roots arrived with the crowns removed. I had, therefore, no opportunity of observing whether there had been any late growth of leaves, but from the freshness of the roots and the results above quoted, I should think they had been left in the ground, and not dug up at maturity and stored.

I have now given the results of the examination of roots grown in the different parts of the Waikato, and will not unnecessarily multiply the details for you, but take as a last experiment the result of analysis of roots grown upon Mr. Graham's estate at Tamahere. It was my desire to examine these roots while they grew, and, if possible, to note the time at which they became matured, and on that account, the crop having been sown late, I received samples of the three varieties on the 8th February, resulting as follows: No. 1, weight, 1 pound 1 ounce; percentage of sugar, 8.90. No. 2, weight, 1 pound 6 ounces; percentage of sugar, 7.50. No. 3, weight, 3 ounces; percentage of sugar, 8.38.

These roots were immature, and consequently the results were low. On the 26th March I received another parcel of the three kinds from the same estate, yielding as follows: No. 1, weight, 1 pound 2 ounces; percentage of sugar, 10.55. No. 2, weight, 2 pounds; percentage of sugar, 11.87. No. 3, weight, 1 pound 7 ounces; percentage of sugar, 11.17.

On the 7th of May I visited the ground and chose samples of the three varieties which were still in the ground, rather overgrown with weeds and certainly having been left too long in the earth, the leaves still growing vigorously, the result no doubt of the late rains which had then been falling. Still they were fine roots, averaging from 1 to 3 pounds. They had been planted too far apart, and much space had been lost and room given for weeds to accumulate in. Being rather pressed for time I was unable to make a separate examination of these roots, and therefore I treated them in the aggregate with a result of 12.79 per cent. of sugar.

Finally, on the 29th August, I received samples of each variety fresh from the ground where they had still been allowed to remain, though fully 4 months had elapsed since they had reached maturity. These roots had been growing vigorously, a large crop of young leaves shooting up at the expense of the sugar stored up in the root. The result of the analyses, though low, has surprised me at the amount even yet left in the roots.

No. 1, weight, 2 pounds 9 ounces; percentage of sugar, 7.42. No. 2, weight, 2 pounds 4 ounces; percentage of sugar, 6.47. No. 3, weight, 3 pounds 5 ounces; percentage of sugar, 8.65.

Three of this parcel of roots were fowarded by Mr. Graham to Dr. Hector, Wellington, for analysis, with the result appended.

Results of analysis.—Three roots of sugar beet for sugar. Received 13th September, reported on 22d September, 1881: No. 1, weight, 1 pound 2 ounces; sugar per cent., 8.42. No. 2, weight, 1 pound 10 ounces; sugar per cent., 8.01. No. 3, weight, 2 pounds 10 ounces; sugar per cent., 6.94.

These are fairly good yields.

W. Skey.

In reference to the methods of analysis and the sampling of the roots, I may remark that in every case, to insure a true average, I have punctured the root from crown to apex, taking the core for purposes of analysis, as it is a well-known fact that the sugar is not found in equal proportions throughout, the root being richer in sugar in the lower than in the upper portion. Having thus obtained a fair average of the root, I have accurately weighed and then pulped the assay portion in a mortar with distilled water, and inverted the sugar in the ordinary manner with dilute sulphuric acid, making my quantity up to a known amount, from which I have charged the burette in the ordinary way.

Fearful of the conversion of the woody fiber into glucose, and a consequent false increase of the results, I have frequently checked this process by filtering off the diffused juice from the pulp, well washing the latter, and then inverting the sugar contained, but in all these cases the pulp still retains a small amount of saccharine matter, but the difference between these two methods is so small as not to cause much disparity, and here I will give one experiment to show the difference. A root

of the red-top imperial weighing 2¼ pounds was taken, and two cores from the puncture tube fairly chosen, to the weight of 2 grams each, pulped, and the one inverted with the pulp, the second filtered, the pulp washed and the filtrate inverted, the percentages of sugar being 9.82 in the first portion and 9.50 in the second. The difference I attribute to the sugar still left in the pulp. The methods by which I have determined the percentages of sugar have been with Fehling's copper solution and Knapp's mercuric cyanide solution, both volumetric analyses, the former being in my opinion the most accurate. To insure precision, I have frequently inverted pure anhydrous cane sugar, and estimated my standard solutions with it, and therefore feel justified in saying that the analyses given by me in this paper are reliable.

In addition to the chemical analysis we have the specific gravity, this being a very reliable guide to the value of sugar present, and this I have obtained after expression of the juice on several occasions by means of the balance. Before concluding this portion of my paper on the chemical manipulations it will be interesting in a few cases to note the relative proportions between the chemical values and the specific gravities.

The root already mentioned as having been received from Mr. Walker, Cambridge, and which I estimated to contain 15 per cent. of sugar, was grated until it had lost weight equal to 200 grams, the juice from which being expressed equaled 128 cubic centimeters added water to the pulp and macerated, pressed to near dryness and made up the amount with water 200 cubic centimetres. Found the specific gravity of the pure juice before adding water to be 1.08087, and the percentage of cane sugar in the 200 centimeters to be 14.35, the difference being the amount of sugar still retained by the pulp. Again a root from Mr. O'Neil was grated, 1 pound of which yielded 14¼ ounces weight of juice and 1¾ ounces pulp. The specific gravity equaled 1.0528 and the percentage of sugar in the juice was 11.4.

One more experiment I will give, that of a root weighing 2 pounds, of which 14 ounces was grated, yielding 12 ounces juice and 2 ounces pulp, the specific gravity of the juice being 1.0653 and the percentage of sugar present 14.25.

There is one point in connection with this subject which deserves more than a passing notice, and that is in reference to the presence of chlorides, and especially that of chloride of sodium—common salt—this being so detrimental as to result in a loss of 5 per cent. of sugar for every 1 per cent. of the salt. When making my examination for sugar I have also tested for the presence of chlorine, but only to find a trace in any of the Waikato beet roots, with the exception of those now before you, which, having been left in the ground at least 4 months too long, are heavily charged with chlorides. One interesting feature is the absence, beyond a trace, of chlorides in the roots received from Raglan, already mentioned, and this though grown in the vicinity of the sea. I may state that I have not estimated the amount of chlorides, but simply as a qualitative test.

The distribution of the seed in the Waikato alone was in consequence of its distance from the sea and the very favorable situation and comparative absence of chloride of sodium from the pumice soil, but its cultivation in other portions of the Auckland district fairly deserves a trial.

The great objection to the presence of salt, either from the proximity to sea air, fertilization of the ground with it, or from an abnormal amount being naturally present, is owing to the impossibility of freeing the sugar from this substance, and in consequence the estimation of the chlorides is only second in importance to that of the sugar present. So inimical is this salt that M. Baruchson says: "In some instances the undue proportion of this salt in sugar has nearly rendered the sugar unsalable; and so generally is this recognized abroad, especially in Germany, that the manufacturers in contracting with the growers of the root stipulate that it shall not be grown on certain soils, and often even name the manure which shall be used." It is owing to this substance and the want of sufficient care in eliminating the molasses that beet sugar at one time was strongly objected to on account of the taste, and even

here I have heard complaints of the same character. On this subject Grant, in his Beet Root Sugar, remarks: "There was formerly a prejudice in the minds of many people against beet sugar; but it is perfectly well ascertained that, if properly refined, it can not be distinguished from the best sugar of sugar cane, either by taste, appearance, or chemical analysis; the two are identical." Again, on page 24, he remarks: "The cost of producing from the beet a pure white sugar, entirely free from unpleasant smell or taste, is but a trifle more than is required to produce a low grade. In Germany refined loaf sugar is produced directly from the beet. In France the brown is first produced and then refined. Within the last two years, however, sugar has been produced of such purity and whiteness that it has been sold directly for consumption without refining; and there is no question that the peculiar odor of the beet may be entirely got rid of in the manufactory." I will quote one more authority on this subject, and that one of the highest we could have. I allude to Crookes, who says in his work Manufacture of Beet-Root Sugar: "Crystallized beet-root sugar is perfectly identical in composition with cane sugar and is indistinguishable from it by the sight, the taste, or by chemical tests."

Proceeding from the foregoing facts to summarize my results, I find that the value of sugar obtained from the whole of the roots examined by me last season under 3¼ pounds in weight is a percentage of 11.66, but this average includes the immature ones from Tamahere, made when they were but half-grown, and also these roots now before us, which, having remained in the earth so many months after coming to maturity, have deteriorated considerably. If then we exclude these, the average result of the rest shows a percentage of 12.45; but, as some of the roots examined were practically too small for manufacturing purposes, I propose to exclude all under 1 pound weight, and thus reduce the average to roots between one and three pounds weight, this being a useful size for manufacturing purposes, large enough to pass safely through the washing machine without being lost or clogging the bars, and yet not too large to materially reduce the percentage of sugar. By this exclusion the average is 12.29, my highest being 15 and lowest 9.82.

In arriving at these results, I do so after a series of experiments extending over the past seven months, in which time I have made upwards of 80 analyses and examined more than 60 beet roots grown in different parts of the Waikato, many of them raised under very unfavorable conditions; some I found overrun with weeds, of others cattle had destroyed the leaves, while the majority were planted too far apart, and in almost all cases not sufficiently earthed-up, in consequence of which a portion of the sugar contained in the root, exposed to sun and air, becomes converted into other substances. Yet, notwithstanding all these disadvantages, the average of all the analyses made by me, with the exception of one root weighing over five pounds, was 11.66, while the exclusion of those which would under no circumstances be permitted to enter a sugar factory brought up the total to 12.45, an average return so favorable that it would result in a very large profit were it achieved in the countries where beet-sugar factories are established.

That these results are not exceptional is, I think, shown by the wide area over which I have obtained my supplies for examination; and that it will be fully equaled on the large scale is shown by the unskilled manner in which some of these roots were planted and tended, and also by the request, which in many instances was adhered to, that no manure should be used. So far from this, I feel convinced that, with due attention, proper cultivation, and suitable manuring, a higher percentage will be obtained than from those which the past season's growth has furnished us with; and, should a factory be established for the conversion of beet sugar, I believe the true economy of procedure would be in the purchase of roots at a fixed rate per ton, with an additional schedule price for every degree of sugar above a minimum, a practice which works beneficially amongst some of the German factories; especially would this be the case in the colonies, where the higher price of labor would naturally lead us to seek for the maximum of sugar from a minimum of root. It is not

within the scope of this paper to dilate upon the value to this district should such an industry find a home amongst us, but the benefits would be so great and varied, while the returns which I have now brought before you give so large a promise of success, that I hope the early future may find such an establishment situated where it would be most profitably worked—in the center of the Waikato district—where soil, temperature, and the absence of sea air proclaim its fitness for the growth of the beet.

PRODUCTION OF BEET SUGAR IN VARIOUS COUNTRIES.

The increase of the production of beet-root sugar in various parts of the world has led many to believe that it will eventually supersede sugar made from cane.

Some idea of the growth and extent of the industry can be formed from the latest estimated production of beet root in the various countries of Europe for this season as compared with the actual output of the two previous seasons:

Countries.	1884-'85.	1883-'84.	1882-'83.
	Tons.	*Tons.*	*Tons.*
France	430,000	475,000	423,194
Germany	1,100,000	985,000	848,124
Austria	525,000	445,000	473,002
Russia	340,000	310,000	284,491
Belgium	105,000	105,000	82,723
Other countries	50,000	40,000	35,000
Total	2,550,000	2,360,000	2,146,534

In 1878 the total production of all the countries in the world was 1,101,141 tons, which, as will be seen from the preceding table, is less than one-half of the amount of 1884.

In 1881 the output was 1,860,974 tons, in 1880 it was 1,403,929 tons, and in 1879 it was 1,574,153 tons. It will be seen from Mr. Pond's paper that he quotes from Grant's works on Beet-Root Sugar to prove that the peculiar odor of the beet may be got rid of in the process of manufacture and that there is no difference between sugar made from the beet root and that made from the cane. Crooke's work is also cited to establish the fact that the two sugars are essentially the same. It should, nevertheless, be borne in mind that sugar cane is much richer in saccharine matter than the beet root. I am very well aware that within the last few years the methods of manufacturing sugar from the beet have been greatly improved, but I am also aware that improvements of equal or greater value have been applied to the manufacture of sugar from the cane.

BEET VS. CANE SUGAR.

Much stress is laid on the fact that the improved systems of modern agriculture have very greatly raised the yield of beet-root crops, but it is none the less true that the same systems of agriculture have increased in quite as high a degree the yield of the crops of sugar cane. Mr.

Steel, the analyst of the New Zealand Sugar Company, who has rendered me much valuable aid in the preparation of several reports for the Department of State at Washington on the sugar trade of this colony, has taken great pains to explain to me that, while cane crystallizable sugar is identical in all its properties whether derived from the sugar cane or beet root or from any other source, there are other circumstances which must be considered besides the mere identity of this substance when derived from different sources. For instance, I have learned from him that, associated with the crystallizable sugar, which is the sweetening element, there are naturally present in all sugar-producing plants other bodies which vary greatly in nature and amount in different plants, and which are more or less difficult to separate from the sugar according to their nature.

In the juice of the sugar cane the organic and inorganic impurities are exceedingly small in quantity and not of a nature to impart an objectionable flavor to the sugar; they are moreover comparatively easy of removal. In the beet root the opposite is the case. Here we have to deal with organic and saline impurities in very much greater proportion than is the case with the cane, and these impurities all accounts agree, have a most tenacious and objectionable flavor and smell. The amount of crop got from an acre of land is much greater in the case of cane than of beet. In Germany the yield of cleaned beets per acre may be fairly stated at from 10 to 12 tons. In Queensland and New South Wales the yield of cleaned cane, ready for crushing, is about 30 tons per acre at a low estimate for one-year-old cane, and for two-year-old it may be safely taken at from 50 to 60 tons. Here the cane has a decided advantage, even when we do not consider that it requires much less attention during its growth than the beet root. Again, as I have previously mentioned, the amount of sugar contained in the cane is greater than that present in the beet. From 11 to 13 per cent. is a fair allowance as to amount of sugar in the best beet root. In Australia the canes contain from 11 to 18 per cent. (generally about 14 or 16), according to the age and variety. Then, again, the beet crop has to be replanted after each harvest, while the sugar cane is habitually "ratooned" twice at least; that is, a second and third crop are obtained in succeeding seasons from the same old roots without any replanting.

The pulp resulting from the extraction of sugar from the beet is utilized as fodder for cattle. The begasse, the residue from the crushing of the cane, is in all modern and well-regulated sugar mills utilized as fuel, being burnt along with coal or wood in specially constructed furnaces. Of late considerable attention has been directed to the subject of utilizing the begasse in paper-making. The chief impediment to its practical use is in the hard fiber from the joints of the canes, which is more difficult to pulp than that of the spaces between the joints. In refining the raw sugars produced from beet root and from cane the latter has important advantages over the former.

While there is no difficulty in the way of refining and disposing of the higher grades of raw beet-root sugar, when it comes to working up the lower products the matter assumes quite a different aspect. The impurities in this sugar consist of saline and organic bodies, having a most disagreeable taste and smell, and it is very generally admitted that these cannot be completely separated from the lower grades in the process of refining, and consequently the refined product retains more or less of them; besides, in working the lower grades of beet sugar, the accummulation of impurities renders it necessary to turn out the residual sirups, and this is done in the form of golden sirup. It is also admitted that the products of the cane can be worked to an infinitely further extent in the refining than those of the beet without the necessity of turning out sirup. On the other hand, the golden sirup produced from the residues of the refining of beet sugar has a most objectionable smell, and it is customary to mask this by the use of sulphuric acid, which gives a sharp, biting taste to the sirup. When cane-sugar residues are worked up into golden sirup the product is sightly and palatable, and of an entirely different flavor to that made from the beet sugar.

While it is difficult to distinguish between the higher grades of the refined products of the beet and cane, the lower grades are very palpably marked. The impurities in the two sugars, which differ so much in their properties, and which, as I have said previously, it is impracticable to remove, are, in the case of the beet root, of a particularly persistent nature. Many contend that the sweetening power derived from the beet, and particularly in the lower grades, is inferior to that derived from the cane. It is not disputed that the sweetness is not there, for it is there in exact proportion to the amount of cane or crystallizable sugar present, but it is maintained that the sweetness is masked by the flavor of the impurities inherent to the beet sugar, and hence the inferior sweetening power. The impurities, even in the very lowest qualities of cane sugar, are of quite a different nature, and do not tend to mask the intrinsic sweetening power of the sugar. If we taste a little of the lower grades of raw beet sugar we find that it has little or none of the characteristic flavor or sweetness of sugar, but possesses a very disagreeable, sickly, saline, oily taste. On the other hand, the lowest black "takas" or "concrete" sugars from the cane have always the strong sweet taste. In a modified degree this is precisely the difference between the refined products of the two sugars. The advocates of the cane-sugar industry state that the wasteful methods of extraction which have always been applied to the sugar cane have given the beet root, with the fostering care besowed upon it as an industry, a temporary advantage over its naturally more favored rival, and they confidently believe that it is only a matter of time when the cane will reassume its old position as the principal source of sugar. There is, however, one point in favor of the beet root which I have not mentioned, and that is the possibility of cultivating it in climates too cold for the sugar cane.

I am indebted to Mr. Steel for the following valuable tables showing the analyses of various kinds of representative raw sugars, including beet-root sugars, Australian-cane sugars, Fiji sugars, and sugars from Java, Formosa, and Tokyo, and the analyses of refined sugars, sirups, molasses, etc. These tables were prepared by Mr. Steel while employed in the refinery in this city and in various refineries in Europe, and have never hitherto been published.

Analyses of raw and refined sugars, etc.

BEET-ROOT SUGAR.

Crystallizable sugar	96.00	95.00	94.00	94.00	93.60	91.20	90.50
Other organic matters	1.31	1.10	1.32	1.71	1.41	2.27	2.50
Ash (saline matters)	1.19	1.15	1.17	1.39	1.64	2.23	2.45
Water	1.50	2.95	3.50	2.90	3.35	4.30	4.55
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Netto titre	90.05	89.25	88.15	87.05	85.40	80.05	78.25
Crystallizable sugar	92.00	91.00	88.40	88.50	86.00	86.00	86.60
Other organic matters	2.21	2.66	2.84	3.24	3.39	3.43	3.20
Ash (saline matters)	2.99	3.04	3.11	4.01	4.06	4.32	4.75
Water	2.80	3.30	5.65	4.25	6.55	6.25	5.45
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Netto titre	77.05	75.80	72.85	68.45	65.70	64.40	62.85

BEET-ROOT SUGARS CONTAINING FRUIT SUGAR.

Crystallizable sugar	89.20	88.20	87.50
Fruit sugar	1.82	2.15	1.97
Other organic matters	2.20	2.45	3.29
Ash (saline matters)	2.43	2.60	2.74
Water	4.35	4.60	4.50

CANE SUGARS.

	Australian sugars.						
Crystallizable sugar	96.20	95.50	93.70	92.00	90.60	89.50	82.20
Fruit sugar	.96	1.90	1.17	2.08	3.81	4.12	5.88
Other organic matters	1.16	.75	1.72	2.09	1.48	1.74	4.53
Ash (saline maters)	.76	.66	1.18	1.69	1.39	1.53	2.75
Sand	....	....	....	....	....	....	....
Water	.92	1.19	1.73	2.14	2.81	3.11	4.64
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Netto titre	91.44	90.30	86.13	81.47	80.29	77.73	62.57

	Fiji sugars.				Java sugars.			
Crystallizable sugar	95.90	92.40	89.70	87.30	97.20	95.10	94.50	92.30
Fruit sugar	1.12	2.63	3.29	3.69	.85	1.75	2.45	3.63
Other organic matter	1.01	1.43	1.90	2.80	.85	1.16	.97	1.15
Ash (saline matters)	.34	.67	1.14	1.28	.21	.33	.33	.40
Sand	.04	.03	.05	.05	.06	.07	.07	.13
Water	1.59	2.84	3.92	4.88	.83	1.59	1.68	2.39
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Netto titre	93.08	86.42	80.71	77.21	95.30	91.70	90.40	86.67

CHINA SUGARS.

	Formosa sugars.			Ilo-Ilo.	Takao sugars.		
Crystallizable sugar	80.00	80.00	76.70	82.10	80.60	78.50	76.30
Fruit sugar	7.13	7.38	8.56	6.29	7.02	5.69	2.26
Other organic matters	2.84	3.97	5.93	4.47	4.04	5.11	3.47
Ash (saline maters)	2.18	2.66	2.68	2.30	1.42	2.59	2.79
Sand	.30	.14	.20	.24	.09	.48	.20
Water	7.55	5.85	5.93	4.60	6.83	7.93	8.98
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Net titre	61.97	59.32	54.74	64.31	66.48	61.36	54.09

REFINED SUGARS.

	Loaf sugar.	First white.			First counters.			Yellow.		
Crystallizable sugar	99.50	99.30	98.20	97.70	96.20	94.10	93.30	87.70	85.60	85.40
Fruit sugar	.10	.16	.47	.57	1.05	2.57	3.10	6.84	8.10	7.85
Other organic matters	.14	.20	.12	.85	.49	.83	.53	1.38	1.45	1.67
Ash (saline matters)	.02	.02	.04	.05	.12	.31	.38	1.00	1.28	1.17
Water	.24	.32	1.17	1.33	2.14	2.19	2.69	3.58	3.57	3.91
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

SIRUP AND MOLASSES.

	Golden sirup.		Raw beet molasses.	Raw cane molasses.	
Crystallizable sugar	39.50	27.80	48.80	51.14	46.02
Fruit sugar	28.57	35.71	.54	7.54	12.93
Other organic matters	9.61	13.55	23.22	14.18	10.34
Ash (saline matters)	5.27	5.47	10.94	9.79	11.36
Water	17.05	17.45	16.50	16.65	19.35
	100.00	100.00	100.00	100.00	100.00

Before studying the preceding tables it is well enough to explain that crystallizable sugar is the body to which the sugar owes its sweetness. It is known by various other names, such as sucrose, cane sugar, etc. Fruit sugar is glucose or uncrystallizable sugar. The net titre is the theoretical amount of pure loaf sugar which would be obtained were the sugar refined up entirely into loaf sugar and sirup. It is merely, however, an empirical figure, and its use is solely for comparative purposes, for which it is of great value. It is based on the assumption that each 1 part of ash prevents 5 parts of crystallizable sugar from crystallizing, holding it in solution as sirup; and that each 1 part of fruit sugar has the crystallization of its own weight of cane sugar. Therefore, to find the net titre or theoretical available percentage of sugar in any sample, we multiply the ash by 5, add on the fruit sugar, and deduct the total from the crystallizable or cane sugar; the result is the net titre.

On the examination of the table of analyses it will be seen that cane sugar is superior to the product of the beet in net titre. Thus, a cane sugar containing 90.60 per cent. of crystallizable sugar has a net titre

of 80.29 per cent., while a beet-root sugar has a net titre of 80.05 per cent. This holds good throughout the whole series. These analyses of beet-root sugar, Mr. Steel informs me, are fair representatives of the sugar of this class imported to the Greenock refineries. The analyses of cane sugars will give an idea of the composition of the sugar from the main sugar-producing districts imported into Australia. The refined sugars are average products of a refinery working cane sugar. The golden sirup was made in a refinery in Greenock, working a mixture of beet and cane sugars. The composition of the molasses from the beet and cane factories varies exceedingly according to the system of working. Beet-root sugar seldom contains any fruit sugar.

G. W. GRIFFIN,
Consul.

UNITED STATES CONSULATE,
Auckland, December 1, 1884.

SUGAR IMPORTS AND EXPORTS OF THE UNITED STATES.

Imports and exports of sugar into and from the United States during the fiscal year 1890.

[Commerce and Navigation for the year 1890—Bureau of Statistics, Treasury Department.]

IMPORTS—DUTIABLE.

Countries from which imported.	Molasses.		Sugar, Dutch standard in color (not above No. 13, and tank bottoms, sirups, melada, etc.).			
			Beet sugar.		Cane, and other	
	Gallons.		*Pounds.*		*Pounds.*	
Austria-Hungary			60,591,333	$1,577,244		
Belgium			19,329,390	498,858		
Brazil					73,800,970	$1,659,251
Central American States:						
Guatemala					583,934	24,331
Salvador					1,876,450	69,846
China					606,644	15,407
Danish West Indies	78,244	$11,371			13,642,707	474,893
France	34	53	844,956	21,019	729,092	23,935
French West Indies					4,074,480	124,248
Germany			512,009,173	16,031,431	2,411,584	65,794
England	268	78	5,958,944	167,104	23,587,254	763,889
Scotland					22,400	546
Nova Scotia, New Brunswick, and Prince Edward Island	86,648	23,687			1,556,238	55,828
Quebec, Ontario, Manitoba, and the Northwest Territory	9,983	2,226			717,086	48,328
British Columbia					192	6
British West Indies	2,119,049	320,430			291,306,725	8,589,677
British Guiana	7,213	834			135,971,015	4,323,702
British Honduras					391,144	11,456
Hong-Kong	14	1			29,367	681
British possessions in Africa and adjacent islands					16,002,445	381,898
Mexico	7	6			747,012	27,015
Netherlands			2,385,680	52,761		
Dutch Guiana	73,863	7,680			3,422,371	103,694
Dutch East Indies					111,929,287	3,722,320
San Domingo	400	96			47,033,940	1,715,364
Spain						
Cuba	24,918,292	3,679,076			1,041,072,929	35,420,441
Porto Rico	4,106,368	1,110,473			76,926,934	2,750,774
Philippine Islands	15,415	3,469			259,775,540	6,814,397
Turkey in Europe	2	1				
Venezuela					218	5
Total	31,415,800	5,150,481	601,119,476	18,348,417	2,108,218,158	66,187,726

FROM THE HAWAIIAN ISLANDS—FREE OF DUTY.

	Quantity.	Value.
	Gallons.	
Molasses	81, 443	$9, 314
Sugar, brown	224, 457, 011	11, 549, 828
All other		861

EXPORTS.

Countries to which exported.	Molasses and sirup.		Sugar, brown.		Sugar, refined.		Candy and confectionery.
	Gallons.		*Pounds.*		*Pounds.*		
Argentine Republic	50	$30			347	$25	
Austria-Hungary							
Belgium	165, 007	27, 690					$10
Brazil					8, 491	600	200
Central American States:							
Costa Rica	349	151	28, 754	$1, 880	155, 158	11, 617	6, 252
Guatemala			8, 120	480	34, 576	2, 546	1, 645
Honduras	53	28	16, 165	967	208, 294	15, 757	418
Nicaragua	2, 027	478	45, 931	2, 743	304, 419	22, 004	542
Salvador					532	44	472
Chile	801	201			1, 263, 415	87, 047	26
China					9, 438	803	595
Colombia	334	220	10, 856	641	1, 816, 928	141, 929	2, 266
Denmark	183, 438	37, 456			15, 115	1, 302	
Danish West Indies					305, 854	22, 501	304
Ecuador					2, 785	218	205
France					750	54	23
French West Indies	100	19			10, 169	768	
French Guiana					59, 534	4, 329	
Miquelon, Langley, Saint Pierre Islands	8, 716	2, 185			450, 538	28, 138	781
French possessions in Africa and adjacent islands					2, 803	116	
French possessions in Oceanica					316, 980	23, 272	375
Germany	272, 116	56, 147	675	40	147, 353	9, 984	754
England	2, 670, 890	388, 790	1, 702	180	5, 688, 627	368, 574	41, 565
Scotland	2, 018, 602	275, 190			1, 502, 394	105, 648	11, 135
Ireland	82, 159	8, 395					
Novia Scotia, New Brunswick, and Prince Edward Island	14, 990	4, 083			182, 691	12, 129	2, 533
Quebec, Ontario, Manitoba, and Northwest Territory	222, 719	42. 649	82, 000	4, 612	311, 550	14, 394	17, 898
British Columbia	28, 863	8, 698			169, 275	10, 628	2, 389
Newfoundland and Labrador	1, 280	275			256, 276	16, 885	2, 286
British West Indies	275	97	1, 788	127	1, 713, 090	136, 417	8, 709
British Guiana					2, 422	205	34
British Honduras	360	164	5, 020	310	96, 208	7, 062	259
British East Indies					4, 968	417	1, 316
Hong-Kong					3, 910	265	105
British possessions in Africa and adjacent islands	930	362			425, 063	33, 619	50
British possessions in Australasia	11, 030	2, 079			7, 097, 629	487, 000	10, 415
British possessions, all other	440	140	1, 000	90			
Hawaiian Islands	1, 340	299			1, 280, 819	91, 833	3, 843
Haiti					1, 665, 188	129, 714	2, 369
Italy					500	40	5
Japan					186, 317	14, 580	392
Liberia	10	7			36, 035	2, 555	12
Mexico	261	123	5, 456	448	541, 481	41, 464	4, 660
Netherlands					69, 769	5, 493	
Dutch West Indies	20	8			145, 343	11, 317	1, 147
Peru	51	18					1, 524
Portugal					4, 041	280	
Azore, Madeira, and Cape Verde Islands	2, 054	486			242, 704	15, 786	58
Russia on the Baltic and White Seas	20, 619	3, 496					
San Domingo	40	10			251, 655	19, 098	1, 437
Cuba	20	8			1, 229	110	27, 752
Porto Rico					10, 921	828	5, 289
Spanish possessions in Africa and adjacent islands					2, 415	150	
Sweden and Norway	329, 614	76, 176					
Uruguay	300	69			5, 070	450	
Venezuela					1, 455	121	17, 078
All other countries and ports in Africa	10	6			3, 050	209	
All other islands and ports					2, 428	166	153
Total	6, 034, 868	936, 233	207, 467	12, 518	27, 018, 002	1, 901, 396	179, 276

PART II.

FLAX CULTIVATION.

FLAX CULTIVATION.

THE FLAX INDUSTRY OF RUSSIA.

REPORT OF CONSUL-GENERAL CRAWFORD, OF ST. PETERSBURG.

ANTIQUITY OF FLAX AND LINEN.

The cultivation of flaxseed in Europe, and the spinning and weaving, by the most primitive means, of fine linen would seem to antedate history. As far back as the Stone Age the inhabitants of Switzerland and of Lombardy, living in huts and feeding upon roots and acorns, were familiar in a crude way with this industry. It is in evidence also that before the appearance of the Aryans west of the Ural Mountains the Finns cultivated flax to a considerable degree in the north of Europe. Historical memoirs prove that the ancient Hindoos and Egyptians produced flax, the former for its seed, the latter, about 5,000 years ago, for its thread.

The Egyptian linen must have reached a very high degree of perfection, as Herodotus, in enumerating the presents made to the Emperor Amasis, of Athens, speaks of garments made of flax a single thread of which consisted of three hundred and sixty finer threads. According to Pliny, Tacitus, and other Roman authors, the cultivation of flax flourished in northern Italy, Gaul, Germany, and with the ancient Finns, and more especially with the Celts early settled in Ireland.

The history of the flax industry in Russia dates from the discovery of the country. In his "Life of Theodore Petchersky" Nestor states that the monks produced oil from flaxseed, and made for themselves a "strong" linen from the filaments of the stalks. The importance of flax among the early Lithuanians is evidenced by the fact that in their mythology they worshiped a special deity who presided over this industry.

Peter the Great interested himself largely in furthering the cultivation of flax in Russia. In a ukase December 13, 1715, he ordered that in all the provinces the peasants should plow an increased acreage each year to be sown with flax and hemp.

As early as the first half of the present century the cultivation of flax occupied a considerable acreage in Russia, which has gradually increased to the present day, as shown by the fact that notwithstanding the in-

creased consumption at home, the exportation of flax increased from 43,942 tons in 1824 to 76,333 tons in the year 1848. But the emancipation of serfs in Russia gave the greatest impetus to this industry. Although this event obliged many proprietors to abandon large portions of arable land, much of which had been sown with flax, still many of the freed peasants willingly undertook to till the lands abandoned by the proprietors as well as to open up new fields to this branch of agriculture, also to increase the acreage of land sown with flax in the provinces of Pskofv, Smolensk, Tver, Kostroma, and some others.

In 1881, according to information published by the central bureau of statistics, in Russia in Europe, excepting the Polish provinces and Finland, there were 3,776,287 acres under flax, and divided as follows: 2,668,550 acres belonged to the peasants, 1,107,737 acres belonged to proprietors.

It is very difficult to state the exact acreage of land sown with flax belonging to the peasants, because it is dispersed over all the empire; but the figures given above must be considered as underestimated.

Concerning the different acreages sown with flax for the last 7 years, it must be said that no definite information exists, inasmuch as that obtained by the central statistical committee in 1886 has not yet been published, but from the data given to the Imperial Agricultural Department by proprietors we may conclude that until 1884, thanks to the high price of wheat, the cultivation of flax in many districts decreased, whereas in the last 2 or 3 years it has again increased and the cultivation of flax is once more one of the most lucrative products of Russian agriculture, especially as this product has not suffered any decline in prices. On this account the flax producers of the Baltic provinces have taken this industry up again. In many other places the same movement has been noticed, so that it is proper to suppose that at the present time the acreage sown under flax is considerably larger than that of 1881. In the district of Gjatsk, province of Smolensk, for example, twice as much land was sown to flax in 1888 as in the previous year.

FLAX CROP OF 1888.

The general crop of flaxseed in the black soil provinces was satisfactory; the east of Russia, and especially the provinces of Orenburg, Oufa, Samara, and Saratoff were an exception, where this crop was as unsatisfactory as that of spring wheat, and for a similar reason.

In the common-soil provinces of Russia this crop was above the average in the western provinces excepting that of Vitebsk, and it approached the average in the Baltic provinces, as well as those of the north and nothwest. In some places of the industrial provinces flaxseed was completely destroyed by a species of butterfly, and therefore the crop was unsatisfactory. In the central Volga provinces and the trans-Volga forest lands the crop was also below the average.

Statement showing the flaxseed crop per deciatine (2.7 acres) in the black-soil and common-soil provinces for 1888 compared with that of the two previous years.

Districts.	Average crop.					
	Proprietors.			Peasants.		
	1886.	1887.	1888.	1886.	1887.	1888.
BLACK-SOIL PROVINCES.						
Southern sandy soil.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Bessarabia	17¼	26	18	13	27	12¼
Kherson	29¾	19	9¾	19¾	20	6⅛
Tauride	5¼	19	13	6	16	11
Ecatherinoslaw	20⅛	23	4	....	19	4
Don district	27	16⅛	8⅛	....	15	9
Central black-soil provinces.						
Poltava	43¾	29	17⅛	43	26	21¾
Kharkow	28¼	26	16	30¼	23	9
Voronej	38⅛	32	9¾	19¼	30	6⅛
Southwestern provinces.						
Kieff	62¾	22⅛	20⅛	....	15⅛	20
Podolia	....	12⅛	11	....	8	5
Vohlonya	22	22	19	22	17⅛	14¾
Northern black soil.						
Koursk	42⅛	27	16	....	29¼	16¾
Tchernigow	27¼	17	16	....	16¾	18¼
Orloff	27	22	21¾	....	23	19¾
Tamboff	39¼	27	13⅛	27¾	21	13
Toula	36	24	24⅛	32¼	20	17⅛
Riazan	25¾	20	18¾	27⅛	18	19¼
Penza	29	21	18¾	25¼	20	18
Eastern and southeastern.						
Kazan	21¼	21	16¾	20¼	18¼	16
Simbirsk	27⅛	20⅛	22⅛	24⅛	16⅛	17⅛
Saratoff	23	17⅛	16¾	24	12	14¼
Samara	31	14	16	24	18	9¾
Oufa	11⅛	14⅛	13⅛	14¾	14⅛	15⅛
Orenburg	21¼	9⅛	....	32	10¾	12¼
Astrakhan	....	6⅛	....	....	11	....
COMMON-SOIL PROVINCES.						
Industrial provinces.						
Moscow	20¼	13	19¼	....	8⅛	18
Tver	17¼	9⅛	13	17	8	14
Vladimir	17¼	7	13	17¼	7⅛	13⅛
Yaroslaw	13⅛	6¾	11⅛	17	7	11⅛
Smolensk	18	12	16	19¼	12	15⅛
Kalouga	19¼	10	18	19¾	8⅛	18
Western provinces.						
Kovna	11⅛					
Vilna	13¾	16¼	14¾	11	15⅛	15
Vitebsk	11	12	7¾	13⅛	13¼	14
Grodno	....	9	9¾	7¾	9¼	9¾
Minsk	13	16	14¾	....	19¼	13
Mohilieff	13⅛	15¾	15⅛	11⅛	14	15⅛
		16	20	19¼	17⅛	18¾
Central Volga and trans-Volga forest land.						
Nijni-Novgorod	....	12¼	18	....	10¾	16
Kostroma	17⅛	7	11⅛	16	7	9¾
Viatka	16	11⅛	12¼	24¼	9⅛	11
Perm	15⅛	14¼	12¼	13⅛	11	15⅛
Northwestern.						
St. Petersburg	....	12⅛	12¼	....	11⅛	13
Pskoff	7¾	6¼	6	7	7¾	7
Novgorod	16¾	9⅛	11	14¼	9¾	11
Baltic provinces.						
Courland	13⅛	20	19	12¼	16¾	16¾
Lifland	14¾	14⅛	14	14	10⅛	12¼
Eastland	....	13⅛	....	....	12¼	12¼
Northern.						
Vologda	13⅛	10¼	10¼	15⅛	10⅛	10¼
Olonets	....	14¾	11	....	8¾	9¾
Archangel	....	14¾	....	....	11⅛	9

As no average is given for the Polish provinces, I therefore infer that flax was only produced in the provinces of Kalisch and Souvalsk, where it rendered 36 pounds per acre with the proprietors and 66 English pounds with the peasants.

The total yield of flaxseed in 1888.

Districts.	Quantities.
BLACK-SOIL PROVINCES.	
South sandy lands.	*Bushels.*
Bessarabia	354, 554
Kherson	1, 204, 889
Tauride	699, 452
Ecatherinoslaw	1, 205, 630
Don district	1, 758, 676
Total	5, 223, 151
Central.	
Poltava	645, 459
Kharkow	313, 172
Voroney	570, 260
Total	1, 528, 891
Southwestern.	
Kieff	31, 142
Podolia	8, 830
Volhynia	136, 259
Total	176, 231
Northern.	
Koursk	17, 362
Tchernigow	189, 727
Orel	95, 850
Tamboff	962, 210
Toula	67, 425
Riazan	251, 060
Pensa	514, 016
Total	2, 087, 650
Eastern and southeastern.	
Kazan	278, 968
Simbirsk	154, 866
Saratoff	466, 242
Samara	366, 972
Oufa	164, 255
Orenburg	134, 071
Astrakhan	36, 878
Total	1, 602, 252
Total in black-soil provinces	1, 618, 252
COMMON-SOIL PROVINCES.	
Industrial.	
Moscow	133, 708
Tver	380, 693
Vladimir	372, 880
COMMON-SOIL PROVINCES—continued.	
Industrial—Continued.	*Bushels.*
Yaroslaw	284, 076
Smolensk	401, 262
Kalouga	153, 135
Total	1, 725, 754
Western.	
Kovna	782, 347
Vilna	290, 509
Vitebsk	330, 790
Grodno	172, 597
Minsk	300, 677
Mohiliew	87, 596
Total	1, 965, 007
Central Volga and Transvolga.	
Nijni-Novgorod	370, 050
Kostroma	352, 297
Viatka	809, 587
Perm	469, 396
Total	2, 001, 330
Northwestern.	
St. Petersburg	105, 107
Pskoff	475, 369
Novgorod	177, 103
Total	757, 579
Baltic.	
Courland	817, 161
Lifland	201, 503
Eastland	34, 373
Total	1, 053, 037
Northern.	
Vologda	228, 147
Olonets	36, 504
Archangel	18, 290
Total	281, 941
Total crop of common-soil provinces	7, 784, 648
Total crop of Russian Empire	18, 402, 823

From the data obtained from the central statistical bureau, grouped in the following table, it will be seen that in the 50 provinces of Russia in Europe, flax covered about 42 per cent. of the land sown in the black-soil provinces, and about 60 per cent. of that of the common-soil provinces. Although the greatest part of land sown to flax in the common-

soil provinces is sown by peasants upon lands rented by them from the proprietors, nevertheless, the peasants sow to flax 72 per cent. of their own lands in the black soil, and 86 per cent. in the common-soil provinces.

Land sown under flax in Russia.

Provinces.	Total sown under flax.			Percentage of flax sown to total acreage sown.					
				Peasants' lands.			Proprietors' lands.		
	Peasants' lands.	Proprietors' lands.	Total.	Average.	Variations.		Average.	Variations.	
BLACK SOIL.	*Acres.*	*Acres.*	*Acres.*	*Per cent*	*Per cent.*		*Per cent.*	*Per cent.*	
Bessarabia	22,110	22,555	44,665	0.9	0.0 to	2.7	1.9	0.6 to	7.0
Kherson	43,467	120,922	164,389	1.2	0.0	4.9	3.8	2.1	6.0
Catherinoslaw	101,476	151,251	252,727	2.9	0.2	5.4	3.3	4.3	13.5
Tauride	48,645	68,960	117,605	1.6	0.0	6.5	7.4	0.0	26.2
Don District	156,759	105,931	262,690	2.4	0.6	10.7	4.5	2.0	9.7
Varonef	14,088	43,254	57,342	0.3	0.0	1.3	3.0	0.0	9.1
Kharroff	10,035	25,641	35,676	0.2	0.0	0.8	2.1	0.0	4.1
Poltava	9,487	48,402	57,889	0.3	0.0	1.3	2.8	0.0	7.3
Kieff	1,944	3,315	5,259	0.1	0.0	0.3	0.2	0.0	0.7
Podolia	818	2,400	3,218	....	0.0	0.1	0.1	0.0	0.4
Volhynia	15,846	5,867	21,713	0.6	0.0	0.4	0.4	0.0	1.7
Koursk	1,277	656	1,933	....	0.0	0.2	....	0.0	0.3
Tchernigow	24,734	6,523	31,257	1.0	0.2	3.6	0.5	0.0	1.7
Oreel	10,956	1,336	12,292	0.4	0.0	1.1	0.1	0.0	0.8
Tambow	63,396	40,313	103,709	1.5	0.0	3.4	2.0	0.2	6.0
Toula	11,318	640	11,958	0.6	0.0	2.6	....	0.0	0.2
Riazan	35,116	2,192	37,308	1.5	0.0	4.0	0.2	0.0	0.9
Penza	28,868	3,474	32,342	1.2	0.2	3.6	0.3	0.0	0.5
Astrakhan	10,073	224	10,297	1.4	0.0	4.9	0.3	0.0	0.8
Kazan	40,357	462	40,819	1.0	0.3	2.8	0.1	0.0	0.2
Simberia	17,958	4,344	22,302	0.9	0.1	4.0	0.4	0.0	5.0
Samara	50,711	16,335	67,046	0.9	0.1	1.5	1.9	0.0	3.7
Orenburg	35,632	3,772	39,404	1.1	0.2	1.3	1.2	0.2	1.7
Saratoff	27,057	43,562	70,619	0.7	0.0	1.7	2.2	0.0	6.9
Oufa	25,046	2,049	27,095	0.7	0.5	1.1	0.4	0.2	1.8
Totals	807,174	724,380	1,531,554	0.9	0.0	10.7	1.8	0.0	26.2
COMMON SOIL.							0.0		
Moscow	32,524	1,320	33,844	2.4	0.2	7.3		0.0	5.8
Tver	95,718	17,923	113,641	4.6	2.1	11.5	5.6	1.0	13.6
Vladimir	138,788	10,044	148,832	6.5	0.9	16.2	3.2	0.0	10.5
Yaroslaw	91,236	13,659	104,895	7.3	3.8	11.9	7.1	8.4	10.7
Smolensk	84,540	13,647	98,187	4.5	2.3	10.5	8.8	0.2	18.0
Kalouga	38,661	2,076	40,737	2.4	1.5	4.0	0.5	0.0	2.4
Kovna	108,818	27,780	136,598	7.3	3.8	9.5	3.6	2.0	6.4
Vilna	43,408	15,398	58,806	2.8	1.3	6.2	2.0	0.5	5.2
Grodno	20,722	2,643	23,365	1.4	0.6	3.0	0.4	0.2	1.0
Vitebsk	72,578	25,369	97,947	5.5	1.7	10.0	5.8	2.3	7.8
Minsk	39,298	13,265	52,563	2.0	1.5	2.9	1.3	0.4	2.6
Mohilieff	36,882	7,198	44,080	2.5	1.5	4.0	1.5	0.2	4.9
Kostroma	142,603	7,776	150,379	6.3	1.9	15.8	3.9	1.1	12.1
Niji Novgorod	107,174	6,512	113,686	4.3	2.3	9.6	0.9	0.1	10.5
Viatka	246,507	948	247,455	3.2	2.0	6.8	1.6	0.0	5.1
Perm	92,479	7,935	100,414	2.4	1.2	3.1	2.0	0.6	7.2
St. Petersburg	27,167	3,388	30,555	3.9	0.2	8.2	2.2	0.0	5.5
Pskov	170,859	49,531	220,390	13.3	2.0	17.9	12.9	3.7	19.0
Novgorod	43,339	6,169	49,508	2.7	1.6	4.5	1.7	0.5	5.3
Lifland	120,652	59,651	180,303	13.8	0.8	18.6	9.8	0.2	14.6
Courland	30,021	4,047	34,068	4.1	1.7	11.7	1.0	0.3	3.9
Eastland	5,535	1,828	7,363	1.8	1.3	2.4	0.6	0.3	1.3
Archangel	3,804	40	3,844	2.4	0.0	14.3	0.4	0.0	1.1
Vologda	54,224	12,817	67,041	4.4	1.1	11.7	6.1	0.0	9.5
Olenets	11,610	232	11,842	3.4	0.8	13.5	1.5	0.0	8.5
Total	1,859,147	311,196	2,170,343	4.6	0.0	18.6	3.2	0.0	19.0

The reason why the peasants of the common soil provinces, rather than those of the black soil provinces, push the cultivation of flax may be summed up as follows:

In the black soil provinces, where flax is generally cultivated for the seed, it requires virgin land or plowed fields which have remained idle for some time. This requisite is rarely to be found among the peasants, and it often happens that the flax crop is not more valuable than that of wheat or other cereals. On the other hand, in the common soil provinces, with the existing system enforced by the landowners, the cereal crops are generally so poor, that the peasants have difficulty in supporting their families, and therefore they are obliged to devote themselves to other means of livelihood and nothing is left more lucrative in agriculture than the cultivation of flax, especially in the northern regions.

Flax grown for the fiber is raised satisfactorily in ordinary plowed fields, but gives more abundant and a better quality of fiber when sown in waste ground or ravines, having a rich surface soil, thus enabling the farmer to utilize lands not suited to the growth of cereals proper.

Again, in cultivating flax seed, the principal expenses of the proprietor are the rental of land and the labor on the same—that is to say, the same category of expenses, and generally in the same proportion, as for the cultivation of cereals. The production of flax for the fiber, however, demands, besides the work in the fields, nearly five times as many working days to prepare the fiber properly as for the cultivation of the seed.

A landowner of the province of Novgorod states that the cultivation of a deciatine (2.7 acres) of land requires 13 days labor with a horse and 45 days hand labor, and for the working of the fiber it takes 229 days hand labor. It is generally considered that each deciatine of land with an average crop of flax requires from 100 to 150 days of work, of which 25 to 35 are in the field and the remaining 75 to 115 in the preparation of the fiber.

The flax industry requires great pains and hard work, and is therefore less profitable to the proprietors than to the peasants, as it gives the latter occupation outside the field labor and during the winter season. Besides, to grow a good quality of flax-fiber, and to prepare and hatchel it properly, necessitates both patience and skill, so much so that the proprietors who have to hire their laborers often suffer great losses on this account. Therefore, many proprietors of the flax-growing provinces prefer to rent out their land to the peasants for the cultivation of flax, reserving for themselves such land only as can profitably be sown to cereals and potatoes. It often happens that a high price is paid for the rental of land suitable for the cultivation of flax, exceeding in some cases the original value of the land. For instance, in the province of Pskov the average price for the rental of land is between 25 and 50 rubles per deciatine, attaining even the price of 80

rubles per deciatine and even higher in other localities of the Pskov and Ostrow districts, the average rental of flax land in these districts from 1870 to 1880 being about 33 rubles per deciatine.

From the foregoing tables it is furthermore seen that the flax is cultivated in every province, but with varying degrees of success. Of the black-soil provinces, that of Koursk had only sown 716 deciatines under flax, and the amount of land sown with flax in the provinces of Podolia, Kieff, Astrakhan, Toula, Orel, Volhynia, Simberia, and Oufa did not exceed 10,000 deciatines; from 10,000 to 20,000 deciatines of land were sown to flax in the provinces of Tchernigow, Penza, Kharkow, Riazan, Orenburg, Kazan, and Besarabia; about 40,000 deciatines in the provinces of Vorony, Poltava, Samara, Saratoff, and Tamboff; and lastly, more than 45,000 deciatines of land in the provinces of Tauride, Kherson, Ecatherinoslaw, and the Don districts. In general, the principal center of flax cultivation in the southern region of the Empire is restrained to the sandy and central black-soil provinces. The extension of this industry varies also very greatly in the provinces. Some districts do not cultivate flax at all, whereas in the neighboring district of the same province the cultivation of flax exceeds 10 per cent. of all the land sown.

It appears that in the common soil provinces, there are only two districts where the flax industry is entirely wanting; these are the districts of Archangel and Kemsk, situated on the coast of the Frozen Sea. The amount of land devoted to the cultivation of flax in the districts of Mezen and Onega, does not exceed 150 acres. The very small quantity of flax grown also in the districts of Povienetz, province of Olenets, in the vicinity of St. Petersburg and in several other places is explained by the fact that in these places the industry has neither an industrial value, nor are the laborers in these districts competent to satisfy the demands of the market as to quality. But in general, the cultivation of flax in the common soil provinces shows itself more evenly distributed than in the black soil provinces, where it is not cultivated for its fiber, which is so necessary to the peasants for making their linen and other necessary household articles, but for the seed, which is all exported.

If the common soil provinces were grouped to show the relative amount of land sown to flax the provinces at the head of the list would be Pskoff and Lifland. More than a tenth of the arable land in these two provinces is devoted to flax, and in some districts it even amounts to 20 per cent. of the whole. There are some districts in the above-named provinces, as well as in those of Tver, Vladimir, Smolensk, and others, where all the spring fields are sown to flax. In the provinces of Jaroslaw, Kovno, Vitebsk, Vladimir, and Kostronia, the provinces of Tver, Vologda, Smolensk, Viatka, Olenets, St. Petersburg, Niji-Novgorod, and Courland, the amount of flax cultivated is only six deciatines in a hundred and in some of the neighboring provinces, two

deciatines, while in the provinces of Eastland, Grodno, and Archangel one deciatine to the hundred is sown to flax.

The picture, however, presents itself somewhat differently if we examine the figures of flax cultivation. In this case it appears that this cultivation is concentrated principally in two regions of the Empire, the first being the eastern region, extending from Upper Volga to Upper Kama, embracing the provinces of Tver, Jaroslaw, Vladimir, Kostroma, Vologda, Niji-Novgorod, Viatka, and Perm, and including almost the half of all the land devoted to the cultivation of flax in the common soil provinces of the Empire. The center of the other, the western region, is the province of Pskoff. To this region, besides the province of Pskoff, belong also those of Lifland, Vitebsk, Kovno, and Smolensk, and the proportion of flax land in these provinces is 24 per cent. of the entire arable fields. It therefore follows that in the remaining twelve out of the twenty-five common-soil provinces the proportion of land devoted to the cultivation of flax is about 25 per cent., and this is devoted to the cultivation of flax fiber.

In speaking of this industry in Russia, it must also be said that flax is also grown in almost every province of the kingdom of Poland, although in most cases only in quantities sufficient to supply the home demand. In western Siberia the surface of land devoted to the cultivation of flax fiber is also considerable and the product finds a ready sale in St. Petersburg, whence it is exported to European markets. In the district of Turkistan the large proprietors cultivate flax simply for the seed. Flaxseed is also the principal reason for which flax is sown in the Caucasus, although in some places, in the district of Lenkoran, for instance, the dolgounets-flax is sown, and an excellent fiber is produced. Lastly the amount of land sown to flax in Finland is about 13,550 acres. Thus, taking the whole Russian Empire into consideration, it can be said that the cultivation of flax in Russia occupies about 4,150,000 acres.

The data received by the Agricultural Department from proprietors relative to the flax crops for the last 7 years show excessively small figures. So that the flaxseed crop per deciatine (2.7 acres) for the average of 5 years, in the common soil provinces, is about 18 bushels and in the black soil provinces about 16 bushels. The crop of flaxseed is still less in those regions where the principal object of the flax growing is the production of the fiber and therefore flax-dolgounets (high-growing) is sown, which forms comparatively small heads, with seed, and is reaped before its complete maturity, whereas where flax is cultivated with the object obtaining the seeds a crop of 20 to 30 poods of seed per deciatine is considered unsatisfactory.

The average crop of seed for 5 years in the south sandy lands varies from 16 to 21 poods per deciatine. It must be stated, however, that this region during the past years has suffered greatly from drought, a condition that affects flax-growing more seriously than the cereal crops. The principal reason, however, of poor flax crops must be attributed

to the fact that fresh or virgin land is no longer to be found, and that soft natural earth, bearing from year to year the same crop, has lost in a considerable degree its productive qualities.

The tables below show the average crop of seed to the deciatine, the general crop per province, per region, and for the whole Empire, with the exception of Poland; the average local price of seed per pood, and the value of the total produce of flaxseed in Russia. The figures contained in these tables prove that of the total quantity of flaxseed produced in Russia the common soil provinces produce 53 per cent., and the black soil provinces 48 per cent. Besides this, the flaxseed grown in the south is principally oleaginous, and is valued in the interior markets, as well as in those of Europe, somewhat lower in price than seed received in most of the common soil provinces, although the latter is also destined for the mills, but its principal importance is as seed for the next year's crop.

In reality, of 11¼ bushels, which is the average crop per 2.7 acres of land in the common soil provinces, 40 per cent. is retained by the proprietors for seed, and the portion which is exported is mostly purchased for seed by German and Belgian proprietors, who reap their own flax before the seed has matured. The local demand for flaxseed as seed is exceedingly large after a rainy summer, and likewise in the northeastern region when an early autumn sets in. In general, the highest average local prices are given in the provinces of Olenets, Jaroslaw, Kostroma, Vladimir, and Pskoff, which finds its sale of flaxseed secured by all the flax-producing region of common soil provinces; and lastly, the provinces of Courland and Lifland, which also produce flaxseed of high quality, readily sold abroad. Good flaxseed for sowing purposes grown in the province of Pskoff is highly esteemed, and brings from $3.10 to $3.90 per bushel.

Thanks to all the data obtained it is seen that in the average for the period, 1882–1886, in the common soil provinces, 13 copecks more per pood of seed were paid than for the seed of the black soil provinces, and the total cost of seed produced exceeded the production of the black soil provinces by 3,279,158 poods, or more than 21 per cent. This calculation somewhat varies if the quantity of seed kept for the next year's crop is taken into consideration. In the black soil provinces the amount of seed sown on one deciatine of land differs, according to the locality, from 2 to 10 poods, and on an average about 4 poods.

In the common-soil provinces one estimates that from 4 to 10 poods and on an average 7 poods of seed are required per deciatine. Consequently the quantity of seed required in order to sow the whole land devoted to the production of flax is estimated to be 3,620,151 bushels in the common-soil provinces and 1,459,311 bushels in the black-soil provinces; the quantity of seed which therefore remains for sale in the first-named provinces is 6,367,107 bushels, valued $6,388,809, and in the second-named provinces this amount is 7,206,645 bushels, estimated at

$6,445,940; so that all the empire of Russia in Europe disposes of 13,573,753 bushels of flaxseed valued according to the average local prices at $10,557,360, all of which is intended for the oil-mills and for export.

Flax crop and prices.

Provinces.	Flaxseed.					Flax fiber.			
	Land sown to flax.	Average crop per 2.7 acres.	Average crop per province.	Average price per 36 pounds.	Value of total production.	Average yield per 2.7 acres.	Average crop per province.	Average price per 36 pounds.	Total value of production.
Black soil.	*Acres.*	*Pounds.*	*Bushels.*			*Eng. lbs.*	*Tons.*		
Don District	252, 691	756	1, 313, 455	$0. 57	$1,154,383	....	....	....	....
Ecatherinoslaw	252, 728	720	1, 203, 669	. 62	1,170,038	....	....	....	....
Kherson	164, 389	648	548, 287	. 67	717, 834	....	....	....	....
Tauride	117, 607	576	448, 025	. 65	453, 003	....	....	....	....
Tamboff	103, 736	1, 188	815, 075	. 56	716, 359	....	....	....	....
Saratoff	68, 618	1, 116	521, 232	. 52	421, 619	....	....	....	....
Samara	67, 146	1, 188	526, 793	. 48	393, 339	....	....	....	....
Poltava	57, 891	1, 080	413, 505	. 59	382, 722	....	....	....	....
Varonej	57, 342	1, 080	409, 590	. 57	363, 170	....	....	....	....
Besarabia	44, 666	864	255, 235	. 58	232, 263	....	....	....	....
Kazan	40, 819	900	242, 968	. 51	190, 865	....	....	....	....
Orenburg	39, 404	864	225, 165	. 36	126, 092	....	....	....	....
Riazan	37, 309	1, 080	266, 490	. 50	234, 343	....	....	....	....
Kharkow	35, 377	720	173, 224	. 58	164, 634	....	....	....	....
Penza	32, 543	1, 296	278, 941	. 50	216, 954	....	....	....	....
Tchernigow	31, 258	1, 008	208, 386	. 52	170, 182	....	....	....	....
Oufa	26, 876	1, 152	204, 768	. 42	135, 375	....	....	....	....
Simberia	22, 302	1, 080	159, 300	. 47	116, 466	....	....	....	....
Volhynia	21, 713	1, 036	185, 845	. 57	164, 783	....	....	....	....
Orel	12, 293	1, 080	87, 808	. 65	92, 198	....	....	....	....
Toula	11, 958	828	65, 486	. 55	56, 027	....	....	....	....
Astrakhan	10, 298	720	49, 037	. 48	36, 996	....	....	....	....
Kieff	5, 260	1, 008	35, 064	. 56	30, 817	....	....	....	....
Podolia	3, 218	720	15, 325	. 60	14, 304	....	....	....	....
Koursk	1, 033	1, 080	13, 809	. 61	13, 103	....	....	....	....
Total	15, 516, 375	951	8, 666, 282	0. 57	7, 767, 861	....	....	....	....
Common soil.									
Viatka	247, 455	612	1, 001, 604	. 57	888, 088	468	21, 446	$2. 09	$2, 490, 118
Pskoff	220, 390	432	629, 686	. 81	793, 405	666	27, 182	2. 33	3, 518, 559
Lifland	180, 203	504	600, 678	. 67	621, 368	720	24, 027	2. 08	2, 776. 453
Kostronia	150, 379	432	429. 656	. 70	467, 836	468	13, 033	2. 50	1, 810, 132
Vladimir	148, 332	792	779, 597	, 69	836, 767	684	18, 852	2. 17	2, 272, 713
Koona	136, 598	900	813, 086	. 63	790, 500	630	15, 937	1. 87	1, 534, 894
Niji-Novgorod	113, 686	1, 080	812, 044	. 59	745, 276	558	11, 748	1. 50	918, 999
Tver	113, 640	720	541, 145	. 60	505, 068	684	14, 894	2. 05	1, 639, 315
Yaroslaw	104, 895	612	424, 575	. 71	468, 919	540	10, 489	2. 39	1, 391, 506
Perm	101, 404	576	381, 301	. 52	312, 474	432	7, 612	2. 13	910, 209
Vitebsk	98, 747	576	376, 174	. 62	359, 879	594	10, 862	1. 95	1, 176, 716
Smolensk	98, 188	756	490, 941	. 64	488, 759	720	13, 092	1. 35	986, 900
Vologda	67, 041	684	303, 281	. 67	313, 727	612	7, 617	2. 50	1, 057, 873
Vilna	58, 806	720	280, 030	. 61	263, 538	640	5, 880	1. 81	591, 265
Minsk	52, 564	792	275, 333	. 56	237, 704	558	5, 431	1. 61	485, 772
Novgorod	49, 559	576	188, 794	. 65	190, 882	684	6, 277	2. 12	739, 291
Mohilieff	44, 080	684	199, 410	. 54	165, 954	612	13, 991	1. 43	1, 111, 508
Kalouga	40, 737	900	242, 486	. 56	211, 232	684	5, 160	1. 67	378 732
Courland	33, 969	756	170, 343	. 73	192, 109	882	5, 565	2. 07	6[illegible]9. 974
Moscow	33, 845	864	139, 826	. 68	203, 067	810	5, 077	1. 60	451, 288
St. Petersburg	30, 556	540	109, 128	. 67	112, 887	792	4, 482	2. 25	560, 250
Grodno	23, 366	828	127, 955	. 58	114, 449	468	2. 026	2. 75	309, 375
Olonets	11, 842	720	56, 391	1. 00	87, 720	702	1, 539	2. 70	230, 850
Eastland	7, 363	576	28, 049	. 50	21, 816	828	11, 173	1, 88	1, 166, 957
Archangel	3, 845	576	14, 647	. 62	14. 012	432	807	3, 50	42, 637
Total	2, 171, 490	688	9, 421, 160	9. 64	9, 407, 436	681	10, 528	2. 05	29, 347, 286

The above table shows the quantity of flax fiber obtained per deciatine in the common-soil provinces, the average crop per province, the average price per pood of flax, and the value of the total product, calculated on the average of the five-year period 1882–1886.

It is thus seen that the average yield of flax fiber per deciatine or 2.7 acres is about 631 pounds. As to the variations of average crops for separate years, one can form some idea by studying the following: In 1882 the average crop per 2.7 acres amounted to 684 pounds with the proprietors and 612 pounds with the peasants; in 1883 the proprietors received 684 pounds and the peasants 666; in 1884 the proprietors got 630 pounds and the peasants 576; in 1885 the proprietors received 504 pounds and the peasants 486; in 1886 the proprietors received 648 pounds and the peasants 648; in 1887 the proprietors received 684 pounds and the peasants 648 pounds.

FLAX CROP OF OTHER COUNTRIES.

The flax crop of other countries is much higher than in Russia. Thus, according to data given by the Flax Supply Association in Belfast, 1 hectare of land gave the following number of kilograms: In Germany, in 1875, 352 kilograms; in 1879, 410 kilograms; in 1883, 410 kilograms; on an average 391 kilograms per hectare, or 940 pounds per 2.7 acres. In France, in 1876, 698 kilograms; in 1882, 761 kilograms; in 1884, 815 kilograms; or an average of 758 kilograms or 677 pounds per acre. In Austria, in 1878, 430 kilograms; in 1882, 426 kilograms; in 1885, 502 kilograms; or an average of 453 kilograms or 404 pounds per acre. In Hungary, in 1877, 603 kilograms; in 1882, 413 kilograms; in 1885, 375 kilograms; or an average of 464 kilograms or 415 pounds per acre. In Holland, in 1876, 498 kilograms; in1882, 442 kilograms; in 1884, 518 kilograms; or an average of 486 kilograms or 433 pounds per acre. In Belgium, in 1878, 527 kilograms; in 1881, 502 kilograms; in 1884, 503 kilograms; or an average of 511 kilograms or 456 pounds per acre. In Ireland, in 1878, 284 kilograms; in 1881, 470 kilograms; in 1885, 486 kilograms; or an average of 410 kilograms or 329 pounds per acre. In Great Britain, in 1878, 489 kilograms; in 1881, 471 kilograms; in 1885, 470 kilograms; or an average of 477 kilograms or 423 pounds per acre. In Italy, in 1875, 284 kilograms; in 1879–1883, 290 kilograms; or an average of 258 pounds per acre. In Greece, in 1875, 312 kilograms per hectare, or 258 pounds per hectare. In Denmark, in 1878, 314 kilograms; in 1881, 290 kilograms; or an average of 302 kilograms or 270 pounds per acre. In Switzerland, for the five-year period 1881–1885, an average of 2.83 cwts. per tunland, or 227 pounds per acre; so that Switzerland only gives as little flax fiber to the acre as Russia. The production of flax in Denmark, Italy, and Greece is considerably better; in Germany and Ireland the crops are from 50 to 60 per cent. higher than those of Russia; in England, Austria, Hungary, Holland, and Belgium, the crops are from 70 to 100 per cent., and lastly those of France 200 per cent. larger than that of Russia. If we stop to consider why the crop per acre is so small in Russia, it would seem to be from two causes: the climate and consequent condition of the soil seem to be unfavorable, and, secondly, an important reason lies in the fact that the Russians are neither skilled nor economic farmers.

YIELD OF THE COMMON-SOIL PROVINCES.

It is well known that the process of separating the fiber from the stalk and also the further manipulation of the fiber affect not only the quality but also the quantity of the product received.

Owing to the extensive surface devoted to flax cultivation the total quantity obtained in the common-soil provinces amounts to more than 243,000 tons. If indeed we take into consideration that the flax-lands have been increased considerably within the last three or four years and if we recognize the fact that there are many small farmers from whom the central bureau of statistics was not able to get any data, a conservative estimate would show that the common-soil provinces yielded during the past year not less than 275,000 tons of flax proper.

The amount of flax produced in the kingdom of Poland is not less than 1,800 tons. Again, the cultivation of flax for its fiber, with a view to industry, is extending in many places of the black-soil provinces. For instance, in the province of Kazan, in the northern districts of the provinces of Simberia, Reazan, Orloff, and Tchernigow, in Constantinograd, and several districts of Poltava, as well as in the districts of Tcheliabin and Traitsky, in the province of Orenburg, a noticeable increase is found. Lastly, in every black-soil province where flax is cultivated, a certain portion of the fiber is worked, from which the peasants make, for their own use, a coarse tissue for sacks and underlinen known as Russian crash. At the same time there is no official data as to the exact quantity of flax worked in the provinces of the black-soil region, but without doubt this quantity must amount to at least 50,000 tons.

In Finland, according to official data obtained in 1885, 138 tons of flax fiber was obtained in the province of Newland; the province of Åbo gave 315 tons; Tavastguss gave 740 tons; the province of Viborg gave 264 tons; the province of St. Michel gave 152 tons; those of Kouopia, 101 tons; Vasa, 156, and Ouleaborg, 2 tons, making a total of about 1,600 tons. Thus the total amount of flax fiber produced yearly in Russia in Europe may be said to amount to about 350,000 tons, amounting to 360,000 tons in good years and to 270,000 tons in bad years. In the year 1881 it is known that 270,000 tons of flax fiber were exported abroad.

THE WORLD'S FLAX PRODUCTION.

In comparing the cultivation and production of flax fiber, Russia far surpasses all other countries. Neiman Spallart gives the countries of Western Europe, with the amount of land sown to flax and their respective crops. (See Uebersichten der Weltwerthschaft, Yahrgang 1883–'84, p. 386.)

Country.	Year.	Acres.	Tons.
Germany	1883	267,534	48,753
Austria	1885	210,834	47,209
France	1884	110,035	38,101
Ireland	1885	107,940	23,366
Belgium	1884	99,014	22,134
Italy	1883	169,287	21,306
Holland	1884	26,082	6,001
Hungary	1885	27,089	4,501
Switzerland	1884	27,664	2,851
Denmark	1881	4,754	613
England	1885	2,487	519
Greece	1875	958	133
Total	....	1,053,678	215,496

Considering that in Roumania, Servia, Bulgaria, Turkey in Europe, Spain, and Portugal, of which no data are given, the production of flax amounts to about 4,500 tons, still the total produced in Europe does not exceed 225,000 tons, whereas Russia alone produces about 330,000 tons per annum.

As the yearly production of flax in the United States of America only amounts to about 45,000 tons and the production of all the remaining countries is equivalent to that produced in the Siberian colonies, it follows that Russia produces fully 25 per cent. more flax than all the rest of the world combined.

LOCAL PRICES IN RUSSIA.

The local prices of flax depend upon the quality of the flax rather than upon the quantity. Thus, according to the data received from the correspondents of the department, the average price per pood or 36 English pounds in 1882 was $1.83; in 1883, $1.85; in 1884, $1.93; in 1885, $2.05; in 1886, $2.03; in 1887, $1.96. If we consider the local autumn price paid for flax in the provinces grouped together, we find that in the black-soil provinces the average for 1882–'86 was about $1.50 for 36 English pounds, while in the provinces of Oufa and Orenburg the price was $2.25. In the common-soil provinces the lowest price was about $1.75 in the western provinces; in the industrial provinces this price rose to 1.85, in the Baltic provinces to $2.07 (that is to say, about equal to the prices paid in the central and transvolga provinces), and to $2.25 in the northwestern provinces. If proprietary flax be taken separately, the difference in prices is excessive; in some places the prices fell 50 cents and in other cases they rose to $5 and $6 per 36 pounds; and also in the provinces taken separately the variations of prices were quite remarkable. From the foregoing tables it is seen that in the provinces of Smolensk and Mohilieff the average price for five years did not exceed $1.50, whereas in the provinces of Kostroma, Vologda, Archangel, Olenets, and Grodno the price rose to $2.50 and higher.

In the provinces which produce the most flax fiber, namely, the provinces of Viatka and Lifland, the pood costs about $2.10 and in the province of Pskoff about $2.33.

Because of the difference in prices, the value of the total production according to provinces does not agree with the distribution of the latter according to the quantity produced, leaving out of the question the amount of land sown. For instance, the province of Viatka, which has the largest acreage devoted to the cultivation of flax, occupies, according to the value of the fiber produced, only the third place, giving precedence to the provinces of Pskoff and Lifland. The total value of fiber produced in the common-soil provinces exceeds $30,000,000, and, if to this amount is added the amount of fiber produced in the black soil provinces and the annexed provinces, the total value of the production of flax fiber throughout Russia in Europe amounts to $36,000,000. I have already shown above that the value of the flaxseed produced amounted to $17,175,297; therefore the total gross revenue obtained from the Russian flax industry amounts to about $53,000,000.

FLAX CULTIVATION.

It is difficult to learn the net profit of the flax industry, having at present only the above data, but there is no doubt that it, in many places of the common soil provinces, is one of the most profitable of the country, especially if carefully managed.

If the proprietors are robbed and the manipulation of the fiber passes into bad hands the result will be, as is too often the case, that the proprietor is bankrupt. The instances are great in number and are met with in all the provinces devoted to the culture of flax. Prince Vassiltchikoff says that to his knowledge certain proprietors and villages have been completely ruined by the cultivation of flax, through unbusinesslike methods, such in fact that result in a few years in rendering the soil absolutely worthless. In the flax-producing districts of the province of Pskoff the rental of land for flax is called "a sale;" "to rent" and "to sell" in those places are synonymous terms, and the prices for renting land, as has been mentioned above, often equal the selling prices. In fact after a crop of flax, if the land is not properly manured or is not allowed to rest a year or two from flax cultivation, it loses all its producing qualities and becomes worthless. Therefore the peasants of the province of Pskoff have been observed to emigrate from the northwestern flax-producing districts to the southeastern districts, where there still exists plenty of virgin soil.

But it is well known that there are means of conducting a regular series of flax crops without injury to the land. If a peasant has means sufficient he knows how to improve his lands by the use of artificial and vegetable fertilizers, which he uses to his profit. But even the poor peasant understands that he must practice the system of crop rotation, or his little farm will soon be ruined. Experience proves that flax uses up the land, at least for the purposes of flax-growing, so rapidly that the same field can not be flax-sown oftener than every 6 or 7 years without irreparable injury to the soil.

The Russian cultivators of flax sow very different crops upon their flax fields to keep their lands from deteriorating; but the most successful seems to be that of alternating their fields with wheat, clover, and other species of grass for fodder. It has been already proved that unless the flax fields can be rotated with pasture-land fields for the raising of cattle and horses, or with a series of successive clover crops, the flax lands soon become unproductive. Therefore an economic school of farming is coming into general favor in many of the provinces, which combines with great success stock-farming with flax-raising.

According to data obtained in 1883 by the flax committee attached to the Imperial Voluntary Economic Society the cost of production of flax per deciatine is as follows:

Provinces.	Average cost of—		
	Production.	Preparing fiber.	Total.
Minsk, Vitebsk, Vilna	$7.30	$10.50	$17.80
Pskoff	7.80	10.85	17.60
Novgorod, Tver, Smolensk, Kalouga	9.35	9.00	18.35
Vldimir, Yaroslan, Vladimir	8.60	12.20	20.80
Vologda, Viatka	6.85	8.50	15.35
Average	7.80	10.20	18.00

The above figures are incredibly low, and can only be explained by the fact that the peasants receive a mere pittance for a day's labor. To speak in comparative figures with reference to the wages of the workmen of other countries, the expense of working a deciatine in flax would not cost less than $20.

PROFIT OF FLAX-GROWING.

From 1 deciatine of land sowed to flax the farmer derives in the common soil provinces about 15 bushels of seed and about 610 pounds of flax fiber. Setting aside 4½ bushels of seed for the next year's sowing, there will remain 10½ bushels of linseed, or an income from the seed alone amounting to more than $9 per deciatine. The flax proper, 610 pounds, would average about $36, so that the total product would be about $45 per deciatine. The average expense for cultivating this amount of flax land is about $20 and the rental of the land is fairly estimated at $7.50; therefore one would have a net profit of $17.50 per deciatine. This is certainly a very good revenue even for the proprietor who has to hire all of his labor, and still better for the peasants who do their own work.

HOUSE INDUSTRY VERSUS FACTORY.

At the beginning of this report it was said that the ancient inhabitants of Novgorod conducted a large flax business, not only with the neighboring principalities, but with the Hanse towns of the Baltic. Besides the amount exported there existed at that epoch a sale of flax

fiber in such places of the interior districts in which it was not produced at all or was produced in insufficient quantity. Similar movements of flax exist also to-day, but with this difference, that to-day the export of flax abroad has taken immense proportions, consuming one-half of the total production.

It must also be said that the means and character of the home trade has greatly changed. Every family prepared from its own crude flax linen and cordage necessary for its domestic use. Later on small industrials presented themselves in some places, working either for others according to order, or making different flaxen articles for sale, for which they generally purchased their flax elsewhere than at home. In this manner there were opened more or less important centers for the home consumption of flax fiber. In time linen mills were introduced into Russia, forming already a more solid center for the sale of flax goods than could be depended upon with the "Koustar" trade.

Not entering into details, it must still be said that the total amount of crash or linen made by the peasants, prepared for sale, amounts to 117,000,000 yards. According to data taken from the collection of "military statistical collection" the province of Viatka is at the head of the Koustar linen and crash industry, and prepares about 18,000,000 archines or 14,000,000 yards per annum; then come—

	Yards.		Yards.
Yaroslaw	12,500,000	Kostroma	4,670,000
Tver	8,560,000	Koursk	3,890,000
Vologda	7,800,000	Orel	2,730,000
Perm	5,840,000	Tamboff	2,400,000
Kalouga	5,500,000		

In the western region the extension of the flax industry has increased, but the sale of the Koustar flax products has for some time decreased, and for the last few years is decreasing to such an extent that all the surplus fiber is sent in its crude state to points whence it can be exported. For instance, in some places of the province of Lifland, the peasants not long ago occupied themselves with the manufacture of linen and crash, and sold their work not only in the villages and towns of that province but in St. Petersburg, Moscow, and other towns in central Russia. The rapidly advancing manufactories have obliged the Koustars almost to abandon their industry. In the same manner the Koustars in the above-named provinces of the northeastern region are beginning to abandon their industry, forced to compete with large flax mills.

The first spinning mill in Russia was erected in the sixteenth century, when the English had opened a trading-way through the White Sea. The English opened a rope mill and flax-spinning mill at Kholmogar.

Peter the Great undertook a number of means to develop the number of linen factories in Russia, and his imperial successors did the same. According to statistical information of the last century the number of mills in existence were:

In 1761, 54 mills, producing \$320,753; in 1765, 60 mills, producing \$451,435; and in 1776, 70 mills. The beginning of the present century has been marked by wars which could not do otherwise than influence not only the Russian export of raw material, but also the manufacture and the exportation of manufactured goods; and notwithstanding this, in 1809 the Russian production of linen was represented as follows:

Provinces.	Mills.	Looms.	Production.	Mills exporting.	Exportation.
			Yards.		*Yards.*
Vladimir	110	7,818	8,078,155	16	8,599,160
Kostroma	24	4,341	3,587,888	11	2,794,532
Kalouga	20	2,283	1,628,433	12	1,122,839
Moscow	19	968	890,854	?	69,417
Yaroslaw	13	2,302	1,633,528	?	251,222
Smolensk	7	528	253,509	1	38,888
Tver	5	168	229,444	......	......
Toula	2	228	157,017	2	134,128
Mohilieff	5	97	50,683	1	31,265

However, the hesitancy of Russian manufacturers to adopt improved machinery, the increase of cotton mills and their produce, and the success of flax factories abroad, place most of the mills in Russia in an embarrassed position from a lessening demand and consequent fall in prices, and gradually decreased their number until the result was as follows: In 1820, there were 214 mills in Russia; in 1830, there were 190 mills; in 1835, there were 171; in 1863, there were 109 mills, producing to the value only of \$4,025,000.

In the recent years there is again an increase, both in the number of mills and in their productions. The following table will show this reaction for 1880–'84:

Years.	Russia in Europe.			Poland.		
	Mills.	Value of product.	Laborers.	Mills.	Value of product.	Laborers.
1880	158	\$12,402,500	24,631	15	\$1,348,500	9,339
1881	153	11,869,000	33,688	14	1,138,000	7,298
1882	154	12,022,000	32,170	18	1,528,000	7,425
1883	160	13,565,000	35,991	21	1,920,000	8,402
1884	166	13,173,500	38,966	19	1,871,500	7,810

The yearly product of flax mills and flax-beating works of Russia in Europe in 1884, is as follows: Twelve factories produced less than \$1,000; 61 produced from \$1,000 to \$5,000; 18 produced from \$5,000 to \$12,500; 14 produced from \$12,500 to \$25,000; 15 produced from \$25,000 to \$50,000; 26 produced from \$50,000 to \$250,000; 14 produced from \$250,000 to \$500,000; and 6 produced from \$500,000 to \$1,000,000.

The value of the production of one mill alone in the Kingdom of Poland exceeded \$1,500,000. Out of the 166 mills and factories in the provinces of Russia in Europe, 55 occupied themselves with cleaning the flax by breaking and hatcheling; 24 with the preparation of yarn, 87 with the manufacture of linen.

The table below shows the division of these three classes of factories:

Provinces.	No. of works.	Production.	Value.	Laborers employed
		Tons.		
Pskomir	40	12,114	$1,483,500	1,290
Vladimir	8	1,710	213,500	486
Olonets	3	171	19,000	173
Tver	2	774	67,500	212
Viatka	1	468	50,000	470
Poltava	1	72	10,000	155

As seen, of the 324,000 or 342,000 tons of flax which are produced yearly within the limits of Russia in Europe, the flax mills only consume about 18,000 tons. This table, however, can not be said to be exact, as the statistics obtained from the province of Viatka show that in the district of Vélij the flax produced by the peasants is mostly bought up in its crude state and worked by the inhabitants of that province. During the winter some 300 or 500 peasants of the district of Tchepel are employed each day cleaning the flax. The district of Vélij prepared and exported about 18,000 tons of flax during the winter 1886–'87.

Some of the spinning mills have textile departments attached to them, with a total of 1,160 looms, on which 242,000 pieces of linen and duck, and 480,000 sacks or bags are manufactured, for a value of $1,097,000. Thus the real annual product in the 24 factories, shown below, amounts to $7,636,000.

Flax-spinning Mills.

Provinces.	Number of mills.	Quantity of yarn produced.	Value.	Laborers employed.	Number of spindles.
		Tons.			
Vladimir	8	7,380	$2,007,500	6,374	51,200
Kostroma	6	7,110	2,053,500	6,390	63,000
Yaroslaw	4	5,462	1,672,000	4,518	40,000
Riazan	1	1,278	253,000	715	7,600
Karan	1	450	187,500	1,000	12,700
Vologda	1	432	175,000	1,304	3,784
Liefland	1	396	125,000	335	4,000
Courland	1	126	60,000	117	2,000
Nize-Novgorod	1	27	5,500	27	500
Total	24	22,661	6,539,000	20,780	184,784

Linen Factories.

Provinces.	Number of miles.	Pieces of linen produced.	Value.	Workmen employed.	Number of looms.
Vladimir	32	452,000	$1,867,500	7,165	2,521
Kostroma	24	327,300	1,080,000	5,329	2,800
Moscow	10	16,800	101,000	636	421
Tchernigow	10	5,300	18,500	164	90
Yaroslaw	4	60,000	245,000	281	300
St. Petersburg	2	125,200	490,000	1,421	253
Tamboff	2	7,400	9,500	43	42
Novgorod	1	40,000	100,000	425	72
Kalouga	1	1,500	16,500	87	20
Tver	1	500	2,000	10	10
Total	87	1,036,000	3,930,000	15,481	6,529

Besides these, different textile works prepare 300,000 pieces of linen on 1,160 looms, for a value of $1,097,000, so that the total amount of linen manufactured amounts to over $5,000,000. It appears that the

flax mills are mostly concentrated in that group of provinces called the industrial provinces. In these provinces the number of purchasers for flax mills is greater than in other parts of the Empire, so that the peasants, having profitable work, do not trouble themselves with the preparation of linen and crash even for their own use. Besides this, these provinces raise a large quantity of cereals under the plan of crop-rotation mentioned above, and are one of the principal centers where flour is made, so that the demand for flour bags, as well as for sail-cloth for the river boats, is more important than in any other part within the limits of Russia in Europe. Many trials to revive the flax industry in the western flax-producing provinces have proved futile, principally because of the meager demand for manufactured articles and because of the comparatively easy sale of crude flax for export.

PREPARING THE FIBER.

For this reason, in the western region there exist no really favorable conditions for the preparation of flax-fiber and its separation from the stalk. As has been said, the flax industry in Russia is mostly in the hands of the peasants, who pay too little attention to the method of manipulating it and obtaining from the stalk a clean, well prepared, and assorted stalk for the markets.

The best known method in Russia for separating the fiber from the stalk is the rotting process. The method of moistening the flax is little practiced in most of the places of the eastern flax-producing region, whereas it is still less known and scarcely ever practiced in the southern and western regions, although this method gives a much better flax than that obtained by the process of exposing it to the dew and rain.

When the flax has been exposed, the operation of separating the fiber from the stalk takes from 4 to 5 and even 6 weeks' time, whereas when it has been macerated in summer it only requires from 8 to 10 days.

The color of macerated flax is always more even than that of littered flax; the latter, even in the best conditions, receives different tints, such as light with gray or brown.

The fiber of macerated flax is uniformly strong throughout its whole length, when properly handled, which can not be said of flax exposed to the dew; and in general, macerated flax fiber is stronger than that obtained by the former process, in consequence of which, in working the flax with machinery, separating the good, from 25 to 30 per cent. less yarn is obtained from the flax exposed to the dew than from the macerated flax. This fact very greatly raises the price of the latter compared with that of the former. The yarn obtained from the latter is much rounder and more even than that of the first, in which are often met flat fibers and bits of dried stems.

With the maceration system the chances of a good manipulation of the fiber are much greater than when the flax is exposed to the dew. If the flax which has been grown on a well-known soil is macerated in water, whose quality is known, the proprietor may be certain that he

will receive a uniformly good quality of fiber in a definite number of days; whereas when the proprietor exposes the flax to the weather he is liable to serious consequences, which may occur as well from the excessive rainfalls of autumn as from continued drought, frost, and cold winds, not allowing the flax thus exposed to lie until the time when it could be properly handled, although in a clear and warm autumn, with occasional rain and great dew-fall, the fiber may receive a high quality; but such autumns are very rare.

The obstacle which places itself in the way for changing the method from exposing to the dew to that of maceration is the want of water suitable for the maceration process. And, in reality, every kind of water is not suitable for this purpose. Flax can not be macerated in hard water containing either iron, lime, or salt, nor are stagnant waters, containing slime, clay, sand, and like substances, which injure the color and quality of the flax, to be used for this newer and better process. And, likewise, every field is not suitable for the spreading out of the macerated flax, the worst being reddish clay, red sandy ground, and places covered with slimy and red stagnant water. Some of the best places for maceration are on turf ground and moss ground, as likewise in marshy places of white and blue clay. A very good ground also for maceration is the black soil and sandy soil. In general it is easier to find a ground suitable for maceration than is generally thought, if it be accepted that the maceration should not take place in streams and lakes because of the danger in hygienic relations.

The principal obstacle which prevents the maceration of flax from being extended, is the ignorance of the best means to accomplish it. And even in these provinces, where maceration of flax has long since become the rule, it generally gives dissatisfaction, in consequence of which fact the splendid quality of Russian flax is spoiled even there, after great precautions were taken for its cultivation.

Before being worked, the stalks of the macerated flax, as well as that which has been exposed to the dew, are dried in ovens, and it often occurs that these heated rooms are made too hot or filled with smoke, in which event the filament becomes darker or loses its oleaginous matter and becomes hard and brittle. The working of the flax takes place, in most cases, in the most primitive manner, with simple hand-brakes, which generally injures the too ripe stalks, besides the fact that the most practiced hands can only work about 72 pounds of flax a day. More improved brakes are only to be found in the western provinces, in that of Pskoff and some of the neighboring districts, where some proprietors have installed brakes run by horse-power. Lastly, the final step in the working of the flax, the scutching, takes place in a similar and most primitive manner, for which they use the ordinary wooden scutcher, in the shape of a long, narrow knife or oar.

Scutching by machinery is employed as a rarity, exclusively here and there in the provinces of Lifland, Pskoff, and Vladimir. It may be stated, however, that scutching by machinery only presents an ad-

vantage if the flax has already been sorted according to the length, thickness, and maturity of the stalk. Different qualities of flax can not well be scutched at one time by machinery, because it would become thicker and stick faster in one part than in another, and therefore the the obstructed bollen in the filament would become uneven. If scutched by hand, the laborer can direct his blows where he sees it is necessary, whereas machinery scutches everywhere evenly and it can therefore happen that all the bollen in one place will necessitate such long-continued working that at the same time nearly all the residue becomes ruined. And at the same time it must be remarked that flax is rarely assorted by the Russian farmer.

In general, the manipulation of the flax in Russia is so primitive and poor that, as a result, the price offered for it abroad is much lower than that paid for German, Austrian, Irish, and especially French and Belgian flax. When flax is purchased as it is when it enters the market, the manufacturer can not know what he is purchasing, that is to day, he does not know how much clean flax he will have nor the quality. It is, therefore, easy to understand that the purchaser wishes to guaranty himself against such loss and therefore purchases at very low prices, a fact that causes the Russian farmers to lose needlessly about $15,000,000 a year.

The Agricultural Department urged the Government to take this question up and to use all means to teach the peasants how to work the flax. It reasoned that in Germany and Austria teachers had been called for by the government, and that here the same might be done, or at least to organize model farms on the principle of those in vogue in Finland, for the cultivation of flax, or to install stations in the provinces, where the manipulation of flax could be done by experienced hands, such as the one which has already been organized by Mr. Herman Getze, 9 miles from the town of Viaznikoff, in the province of Vladimir. It is said that the filament obtained by Mr. Getze is most perfect, and therefore his flax sells at $3.50 to $4, and the higher quality from $4.50 to $5 per 36 English pounds, against $1.50 and $2.50 paid for local flax worked by the peasants. Again, Mr. Getze obtains 32 Russian pounds of pure filament and 8 pounds of tow from 5 poods of crude flax, whereas the peasants obtain only 33 pounds of filament from 7½ to 8 poods of crude flax and no tow whatever. Besides these facts Mr. Getze's establishment has proved the great advantages that could be reaped from such stations.

The flax committee of the province of Pskoff has taken up this question and has decided upon the Lefebure system, but it can in no way be compared to the system organized by Mr. Getze.

FLAX-SORTING.

As has been stated above, the Russian farmers in no way embarrass themselves by sorting the flax, but mix all together, thin, thick, long, short, good, and poor. In this shape it is purchased by small dealers

and finally reaches the warehouses of rich merchants, where it is assorted according to its quality. It is generally best assorted in ports whence it is expected to reach foreign markets, and it therefore takes foreign marks or names which are almost historical on account of their long standing.

In Archangel and the localities trading in flax, it used to take the name of the locality from which it came, but, as all kind of swindling was discovered, since 1838, flax in Archangel has been purchased under three sorts named "assorted," kron (crown), and brak or waste. Flax tow is divided into two grades, the first sort being subdivided into three sorts and the second quality into two other sorts.

At St. Petersburg the flax is arranged for export into three sorts, the first of which is according to the number of handfuls, generally contains twelve, and forms a twelve-headed bale; the second is composed of nine heads, and the third sort is composed of a six-headed bale.

In the towns of Rjev and Viaznia, and other centers of foreign export, the flax is in a crude state and forms four sorts, second, third, fourth, and fifth grades, the first quality being assorted, but there is very little of this grade.

In Riga, according to the rules fixed by the exchange committee in 1872, there are 33 sorts, which are divided into 4 divisions: The kron or crown, brak or waste, dreiband or third sort, and dreiband waste or fourth sort. Each of these sorts has received a special mark and name, and at the same time the price in the exchange report is applied to the kron sort only, which is considered as the base for fixing prices. As the price of kron flax has remained the same for the last four years the table given below shows the difference in the prices as they really are.

	Mark.	Price for 10 poods or 360 pounds.		Mark.	Price for 10 poods or 360 pounds.
A. Kron or first quality.			*B. Second quality.*—Cont'd.		
Kron	K.	$22.50	Hofs dreiband weiss	W. H. D.	$22.50
Kron hell (light crown)	H. K.	23.00	Puik hofs dreiband	P. H. D.	22.50
Kron weiss (white crown).	W. K.	24.00	Puik hofs dreiband weiss.	W. P. H. D.	24.00
Kron grau (grey crown).	G. K.	24.00	Fein puik hofs dreiband.	F. P. H. D.	24.00
Puik kron (picked crown).	P. K.	24.00	Fein puik hofs dreiband weiss.	W. F. P. H. D.	25.50
Puik kron hell (light)	H. P. K.	24.50	Superior fein puik hofs dreiband.	S. F. P. H. D.	25.50
Puik kron weiss (white)	W. P. K.	25.50	Superior fein puik hofs dreiband weiss.	W. S. F. P. H. D.	27.00
Puik kron grau (grey)	G. P. K.	25.50			
Superior puik kron	S. P. K.	26.00			
Superior puik kron hell.	H. S. P. K.	26.50	*C. Third quality.*		
Superior puik kron weiss.	W. S. P. K.	27.50	Dreiband	D.	17.00
Superior puik kron grau.	G. S. P. K.	27.50	Puik dreiband	P. D.	18.00
Spanisch weiss kron (Spanish).	S. W. K.	30.50	Livland dreiband	L. D.	17.50
			Puik Livland (lifland).	P. L. D.	18.00
B. Second quality.			Slanitz dreiband (exposed to dew).	S. D.	17.00
Wrack (waste)	W.	19.50	Puik Livland dreiband.	P. S. D.	18.00
Puik wrack	P. W.	21.00			
Puik wrack weiss	W. P. W.	21.00	*E. Fourth quality.*		
Puik wrack grau	G. P. W.	21.00	Dreiband wrack	D. W.	16.00
Hofs dreiband (superior third quality).	H. D.	21.00	Slanitz dreiband wrack	S. D. W.	15.00

Besides the Spanish crown flax, formerly flax was classified in Riga according to nations in which the flax was grown—Belgian crown, French crown, or English crown—the highest quality being the English crown; but with the increased export to Germany, which reëxported the greatest portion of this flax to other European countries, the assortment of Riga flax under classification of different European countries lost all importance.

The marks adopted by the province of Pskoff are those known by the name of Pskoff-Narva brands. The crown quality is divided into four sorts, namely: R., Risten, or very highest; H. D., Hofs Dreiband, high quality; D., Dreiband, ordinary; O. D., Ordinärer Dreiband, ordinary, third sort.

The wrack or waste is not specified, but the above crown marks are subdivided into G, or gray; W., or white; although the difference in color does not alter the price. The letters F and P express the quality of the fiber, F., or fine, and oleaginous; P., strong and heavy; thus, W. F. P. R. signifies white, fine, strong, highest quality.

PRICES OF FLAX.

The large number of different sorts of flax occasion also a very varied list of prices, besides the variations upon the crops and the demand. Thus in St. Petersburg the prices paid for the different sorts varied per berkovets or 360 pounds in 1884 from $8.50 to $31.50; in 1885 from $8.50 to $32; in 1886 from $9 to $34; in 1887 from $13.50 to $32.

The variations for the average yearly prices during the years 1883 to 1887 are as follows:

Varieties of flax.	1887.	1886.	1885.	1884.	1883.	Average.
Macerated.						
Pskoff assorted	$26.84	$31.84	$27.15	$22.50	$21.00	$25.87
Pskoff ordinary	25.78	28.06	23.79	20.25	19.00	23.38
Louga	23.53	25.85	21.31	18.00	17.25	21.19
Solets, first sort	21.40	23.28	18.88	15.75	15.25	18.91
Solets, second sort	19.65	18.93	15.20	13.75	13.75	16.26
Solets, third sort	14.40	13.39	10.14	10.25	11.00	11.83
Exposed to the dew.						
Yaroslaw	28.65	31.12	29.68	28.00	25.75	28.54
Kootroma	29.60	31.71	30.38	29.50	26.00	29.44
Biejeto	26.40	29.65	25.95	23.25	21.00	25.25
Kachinsk	26.67	28.32	26.00	23.25	20.25	24.90
Volegda	29.65	33.07	30.84	29.75	28.25	30.31
Ouglits	25.75	30.12	26.49	24.50	21.75	25.72
Phominsk	25.50	24.33	24.31	23.75	21.75	23.93
Exposed to dew and worked.						
Melenkow	25.25	25.61	24.54	23.50	22.00	24.63
Rjew	24.50	27.69	26.17	23.50	21.50	24.18

If we separate the different kinds according to their prices it appears that, although in general the difference of the average for the five-year period for different sorts is not the same, it happens that the price of

one grade rises while that of another falls. Thus, for instance, for 1886 to 1887, most of the grades declined more or less in price, whereas, at the same time, Solets macerated flax of the second and third grades and Phominsk exposed flax somewhat rose in price. This fact is also observed in other markets where flax is not classified according to the name of the place where it is grown, but according to its quality, such as in Riga. This fact is due not to the crop, but to the bad assortment. This is the principal cause of complaint received from foreign purchasers, who, when ordering a special mark or brand and not knowing before hand whether or not it will correspond with that of the same mark received the previous year, therefore pay a lower price for it, in order to protect against loss. In Melenk, the pood of flax of an average quality sold from 1885–1887 as follows: In 1885, from $1.25 to $2.13; in 1886, from $1.50 to $2.37; in 1887, from $1.75 to $2.25. The higher quality as follows: In 1885, from $2.25 to $2.80; in 1886, from $2 to $3; in 1887, from $2.25 to $2.87.

In the village of Grodets the price of a high-quality flax varied, in 1887, from $2.50 to $3.13 per pood. In Riga a berkovets or 360 pounds of flax was quoted in the market as follows: 1886, K., or crown flax, from $20 to $24.50; 1887, K., or crown flax, from $20 to $22 50; 1886, H. D., or superior Dreiband, from $19 to $22.50; 1887, H. D., or superior Dreiband, from $18 to $21.

In Warsaw macerated flax brought, per pood: In 1886, from $2.40 to $3.80; in 1887, from $2.40 to $3.15; and dew-exposed flax, per pood, brought: In 1886, from $1.60 to $3; in 1887, from $2 to $3.

In general the variations in the prices of different assorted flax fiber are very great, and as said before depend less on the place where it was grown than in the manner in which it is manipulated and assorted. It is a well-known fact that the best flax produced, when it has not been properly exposed to the dew or macerated or has been badly dried and manipulated, renders the lowest grade of fiber. The peasants' flax mostly reaches the market in its crude state, not having been manipulated. Besides this there is a great complaint of their adding to the flax, thus made up in bundles, sand and other heavy substances of no value.

A very important question is that of the variation of prices of flax for a long period; unfortunately the material on this subject is very scarce and in many instances false, as it is not always known whether the prices refer to high or low grades. But nevertheless it is known that up to the years in 70 of the present century the prices of flax fiber, as well as of other agricultural products, have more or less gradually risen.

Thus in the half of the sixteenth century, 360 pounds of flax in Novgorod cost up to $1.50 and in the town of Kholmogar it cost $2. At the beginning of the seventeenth century, flax in Kholmogar was sold at the rate of $4 for 90 pounds. Considering the quantity of flax ex-

ported and its price, the average for 360 pounds of flax was about as follows:

1749	$10.50	1824–'26	$20.50
1758–'60	11.50	1833–'35	17.50
1778–'80	15.00	1842–'44	14.50
1790–'92	14.00	1845–'47	16.00
1802–'04	19.00	1848–'50	12.00
1814–'15	17.50	1851–'53	14.00
1820–'21	21.50		

These figures, in general, are proved by the following data relative to the average prices in St. Petersburg and Riga, the two principal points of Russian flax export, namely:

Period.	St. Petersburg.	Riga.
1832–'41	$16.78	$15.18
1833–'42	16.50	15.00
1834–'43	16.20	14.50
1835–'44	15.50	14.15
1836–'45	15.30	13.90

According to the price current, as published by the customs department of the ministry of finance, the prices for the exports of flax from Archangel, St. Petersburg, and Riga; from 1855 to 1886, were, per 360 pounds, as follows:

Years.	Archangel.		St. Petersburg.		Riga.	
1852	$13.00 to	$23.00	$10.78 to	$16.00	$9.00 to	$20.00
1853	14.00	24.00	10.78	18.58	11.00	17.50
1854	12.00	21.75	....	....	8.50	16.00
1855	9.75	14.75	....	....	9.50	15.00
1856	14.50	19.00	11.43	15.00	10.50	15.75
1857	16.25	22.38	11.43	17.85	10.50	17.00
1858	16.50	28.65	12.00	22.50	9.00	28.50
1859	17.50	30.00	13.00	27.50	10.00	32.00
1860	21.00	30.00	15.50	24.00	9.50	26.50
1861	20.88	29.00	13.00	22.50	11.00	26.00
1862	20.00	26.13	13.50	26.00	15.00	26.00
1863	21.00	31.00	11.50	23.50	16.50	26.50
1864	22.50	33.50	11.50	19.00	15.00	31.00
1865	22.50	36.75	11.50	19.00	16.50	32.92
1866	29.50	50.00	11.50	33.50	16.50	38.50
1867	20.50	41.00	11.50	30.00	....	....
1868	20.00	37.50	11.50	25.00	12.00	34.50
1869	22.50	39.50	17.00	32.50	13.00	30.65
1870	20.00	36.50	12.50	32.50	13.00	30.65
1871	21.50	40.00	12.50	22.00	13.00	28.50
1872	25.86	31.67	12.50	20.00	16.26	27.31
1873	21.84	31.67	12.50	23.88	15.38	26.93
1874	23.50	29.88	12.50	26.50	17.97	25.65
1875	19.00	36.25	12.50	26.50	12.00	32.00
1876	20.25	38.00	12.50	26.50	20.00	32.00
1877	21.60	40.50	13.00	36.50	15.00	34.00
1878	24.00	39.25	10.50	36.50	16.00	30.00
1879	26.00	39.50	10.50	34.00	15.00	30.50
1880	25.25	37.75	12.00	34.00	....	....
1881	19.00	32.00	12.00	30.00	....	....
1882	22.50	29.50	29.92	27.50	11.00	32.50
1883	21.25	31.25	9.50	29.75	11.50	28.00
1884	20.75	32.25	8.62	31.50	16.50	29.00
1885	22.25	35.75	8.50	32.00	17.50	30.00
1886	23.50	33.50	9.00	34.00	19.00	29.50

The Agricultural Department somewhat criticises some of the above stated prices, and as an instance it says that from 1864 to 1865 the highest price obtained in St. Petersburg, according to all belief, was higher than $19; the lowest price for flax exported from Riga in 1886 being $19. But this price was lower for H. B. and not for D. W., which to all belief was also exported from Riga.

The average prices for periods of 5 years of 360 pounds of flax exported were as follows:

Years.	Archangel.	St. Petersburg.	Riga.	Average.
1852–'56	$16.58	$13.74	$13.28	$14.53
1857–'61	22.72	17.93	18.00	19.55
1862–'66	29.28	18.05	23.39	23.59
1867–'71	29.90	20.70	21.83	24.14
1872–'76	28.26	18.99	22.55	23.27
1877–'81	30.43	22.90	23.42	25.58
1882–'86	27.25	20.08	22.45	23.26

The movement of prices in the markets abroad more or less corresponded with the movement of prices in Russia. Thus in Hamburg, per 100 kilograms of flax, there were paid as follows:

	Marks.	Pfennigs.
In 1847–'50	94	80
In 1871–'75	123	12
In 1885	148	20
In 1886	132	34

Comparative prices of flax in Ireland for 36 years, as published by Villars Stewart in Dublin and London, 1887, are shown below:

	s.		s.		s.		s.
1850	40	to	70	1870	44	to	76
1851	40		60	1871	64		112
1852			40	1872	60		70
1853			46	1873			66½
1854			46	1874	56		76
1860	42		91	1880	50		80
1861	36		72	1881	24		84
1862	56		84	1882	32		80
1863	60		88	1883	36		76
1864	44		84	1884	44		76

If these weights and currency are converted into currency of the United States, 360 pounds of Irish flax for the average of 1880–1884 cost about $51.60, and for 360 pounds of Hamburg flax in 1885 about $60.74; in 1886 about $60.27. As I have already said, French, Holland, and Belgian flax commands still higher and is sold at $70 per 360 pounds. Russian flax, on account of the bad manipulation, is generally sold 50 per cent. less than that of Belgium or France.

According to the Report of the Flax Supply Association in Ireland for the year 1887, the average prices in the London market, for flax of different countries, is as follows, per 360 pounds:

Countries.	1883.	1884.	1885.	1886.
Belgian	$72.58	$71.60	$60.97	$49.85
Dutch	60.00	62.90	59.03	59.53
French	55.16	46.45	38.71	50.32
Irish	52.26	54.19	48.38	44.52
German	30.00	30.97	35.80	34.84
Prussian	30.00	30.97	34.84	33.87

PRICES OF FLAX SEED.

I have already given the average price of flaxseed for the five-year period 1882–1886 at the place of production, and I have shown that, according to the quantity and quality of the crop, the price ranges from 25 and 30 cents to $1.50 and $2 per 36 pounds, going as high as from $2.50 to $3 for the best seed raised in the province of Pskoff, and that of the northeastern flax-producing provinces, whence it is purchased for seed, the difference in local prices does not appear so great, if the average prices grouped by provinces of the common and black soil are taken. According to information obtained from proprietors the prices for six bushels of flaxseed in the black-soil provinces ranged as follows:

In 1883	$5.25	In 1886	$5.11
1884	5.11	1887	4.98
1885	5.74		

The average price was $5.24 per six bushels.

In the common-soil provinces flaxseed sold as follows:

In 1883	$10.24	In 1886	$5.12
1884	5.95	1887	4.78
1885	6.75		

The average for this five-year period was $5.57 for six bushels. As is seen from the above, the differences in the prices, if the different years are considered, is much greater than if the groups of provinces are considered. This is explained by the fact that nearly the whole of the seed produced by the proprietors in both the black-soil provinces and the common-soil provinces of Russia goes to the oil mills, and for this purpose the seed produced in some places, for instance in the province of Borisogliebsk, is more suitable than the seed produced in most of the common-soil provinces, where the flax has been pulled before the plant has fully matured; consequently, the seed obtained in the south gets a higher price than that grown in the common-soil provinces and exported from the Baltic ports and Archangel. For instance, for the five-year period 1882–1886 for six bushels of seed one paid on an average, in Odessa, $7.88, and, in Taganrog, $7. 10, whereas in St. Petersburg only $6.71, in Riga $6.53, and in Archangel $6.19, although some of the qualities brought to the ports obtained higher prices than the best

goods in the southern ports. In the south the different sorts are classified according to the amount of dirt the seed contains, usually from 10 to 15 per cent., whereas the seed in the northern markets is classified, besides that containing dirt, into oleaginous and seed for sowing, the latter being the more expensive, also according to the places where it is grown, a matter of considerable importance in the ports of the Black Sea.

As I have already stated the variations in the prices differ from year to year. This variation depends upon the crops in the other countries of Europe as well as upon the condition of the universal markets. Below I give the tables showing the prices quoted by the exchange in Archangel, St. Petersburg, Riga, Odessa, and Taganrog, from 1852 to 1886, per six bushels.

Years.	Archangel.		St. Petersburg.		Riga.		Odessa.		Taganrog.		Average.
1852	$3.00 to	$3.83	$2.85 to	$4.00	$3.00 to	$4.30	$3.12 to	$3.90	$3.00 to	$3.50	$3.40
1853	3.02	3.78	3.00	4.07	3.00	4.30	2.95	3.62	2.27	3.27	3.27
1854	3.12	3.75	3.00	3.75	2.25	3.75	3.07	4.72	1.50	3.85	3.22
1855	2.30	2.57	2.00	3.00	2.92	4.50	....		....		2.87
1856	2.75	4.12	3.00	5.50	3.00	5.80	4.37	6.32	3.50	6.00	4.43
1857	4.00	5.40	3.50	6.25		5.17	4.87	6.37	4.75	6.50	5.20
1858	4.30	5.00	4.25	5.50	3.50	6.00	4.40	5.75	4.00	5.90	4.87
1859	4.37	4.50	4.25	5.00	2.50	4.87	3.50	5.00	3.75	4.75	4.25
1860	3.50	4.50	3.50	5.50	3.25	5.00	3.50	5.25	4.25	5.00	4.32
1861	4.20	4.90	5.00	6.50	4.75	6.57	4.17	5.90	4.50	6.00	5.25
1862	4.75	6.00	5.00	6.62	....		4.05	6.50	4.00	7.00	5.49
1863	5.65	6.25	3.50	6.62	2.87	5.75	5.25	6.50	4.50	6.75	5.37
1864	4.35	6.00	3.72	6.50	....		5.00	6.50	4.50	7.00	5.44
1865	4.60	6.12	4.56	6.50	5.20	6.00	5.25	6.32	5.50	6.50	6.15
1866	5.90	7.37	5.00	6.50	4.00	6.37	6.00	7.87	5.95	7.50	6.25
1867	5.00	6.45	5.87	6.76	4.00	6.87	6.37	7.37	5.25	7.00	6.10
1868	5.30	6.30	6.37	6.75	3.50	5.50	6.12	6.75	4.87	6.62	5.77
1869	6.12	6.92	6.37	6.87	4.05	5.15	5.50	7.00	5.00	7.50	5.90
1870	5.50	6.45	6.50	7.25	3.62	5.00	5.87	7.25	5.00	7.63	6.12
1871	5.75	6.32	6.25	7.10	4.55	5.62	6.00	7.00	5.25	7.25	6.10
1872	5.67	5.95	6.70	7.33	4.64	4.90	6.13	6.82	6.20	7.10	6.20
1873	5.50	5.67	6.75	7.50	4.29	4.70	6.17	6.55	6.17	6.82	6.05
1874	5.50	5.67	5.81	6.67	4.32	4.60	5.75	6.07	5.89	6.14	5.65
1875	4.90	5.37	5.62	6.50	3.40	4.81	5.62	6.00	5.25	6.62	5.40
1876	4.25	5.50	6.12	6.50	4.12	5.12	5.65	6.12	5.50	6.62	5.55
1877	5.00	7.00	6.50	9.12	3.95	7.00	6.50	7.00	5.50	6.62	6.42
1878	5.35	7.00	5.12	8.75	5.12	7.00	6.75	8.00	6.25	8.00	6.75
1879	6.45	7.15	5.62	8.12	4.37	7.25	8.40	9.00	7.25	9.00	7.20
1880	6.75	6.93	5.62	8.87	5.00	7.50	8.06	9.50	8.12	9.00	7.60
1881	6.50	6.50	6.00	8.37	....		6.07	7.87	6.75	8.50	7.02
1882		6.13	5.12	7.25	5.04	7.50	6.25	7.37	7.00	8.00	6.62
1883	6.33	7.00	5.87	7.12	5.52	5.90	7.02	8.50	6.00	6.32	6.60
1884		6.00	6.25	7.25	8.00	8.75	7.75	8.50	6.25	6.90	7.32
1885	....		5.55	8.75	5.10	8.90	7.75	8.75	6.25	8.12	7.40
1886	5.62	6.00	5.25	8.75	7.00	8.60	7.65	8.75	7.00	7.75	7.23

The information given in this table, which has mostly been obtained from the Report upon the Interior Commerce of Russia, is defective in that the information as to the prices of seed as well as of flax fiber is not complete. It often happens that in some years the data given do not relate to all the grades. With this in view the average yearly export prices of all the five markets must be considered as being approximate. The table below, showing the average yearly prices of seed per six bushels for periods of five years from 1852 to 1886, may be considered as more exact.

Five-year periods.	Arch-angel.	St. Peters-burg.	Riga.	Odessa.	Tagan-rog.	Average.
1852-1856	$3.22	$3.41	$3.67	$4.01	$3.36	$3.54
1857-1861	4.47	4.92	4.62	4.87	4.94	4.76
1862-1866	5.70	5.45	5.01	5.92	5.92	5.60
1867-1871	5.48	6.51	4.77	6.75	6.13	5.95
1872-1876	5.47	6.56	4.49	6.09	6.24	5.77
1877-1881	6.46	7.15	5.27	7.71	7.50	6.84
1882-1886	6.18	6.71	6.53	7.88	7.10	6.88
Averages	5.28	5.83	4.91	6.17	5.88	5.62

Thus it is seen that the price of flaxseed has increased each period of 5 years, having attained in 1877–1886 nearly double that which it had in the first five-year period. In 1872–1876, however, there was a slight fall in the price of the seed as well as in the fiber. The reason why in the five-year period 1882–1886 higher figures were obtained than in the five-year period 1877–1881 is explained principally by the want of exact data from the Riga market. Formerly in this market the price of flaxseed was not quoted for a tchetvert, or six bushels, but for a barrel, which contains two thirds of a tchetvert, or four bushels; the figures shown for the period of 1882–1886 refer without doubt to tchetverts. Therefore the prices of the Riga market, of all the remaining years, are surely calculated one-third lower than they should be; therefore the high rise during the five-year periods 1877–1881 and 1882–1886 is erroneous.

If we add to the above figures the prices of flaxseed for the period 1827–1851 we obtain the following table of the movement of approximate prices per bushel for 60 years:

1827–1831	$0.50	1857–1861	.79
1832–1836	.66	1862–1866	.93
1837–1841	.63	1867–1871	.99
1842–1846	.58	1872–1876	.95
1847–1851	.56	1877–1881	1.14
1852–1856	.60	1882–1886	1.15

Thus, the movement of price of flaxseed ran on a parallel with the price of flax fiber; the prices fell from 1830 to 1855 and rose rapidly after the Crimean war and later after the freedom was given to the serfs. The difficulty of sale and the fall in price in the market, which have affected most of the agricultural products within the last few years, have scarcely affected the flax industry. The most sensitive fall in price of flaxseed as well as of flax fiber was in the year 1887. In that year a bushel of flaxseed brought in St. Petersburg from 79 cents to $1.19, and on an average $1.07 against $1.13 in 1882–1886; in Odessa, from 12 to 14 cents, or on an average 13 cents per 36 pounds against 14 cents in the five year period which preceded; in Taganrog, from 10 to 13 cents, on an average 11½ cents per 36 pounds against 12 cents. In Riga, however, the price of a pood of flaxseed in 1882–1886 was 10½ cents, and in 1887 the price was from 10 to 13 cents, on an average 12 cents.

EXPORT OF FLAX PRODUCTS.

Among the flax products exported, the principal are flax fiber, tow, and different flax manufactures. The following table shows the proportion and gradual increase of export of flax products as it is given for the period from 1749 to 1887.

Years.	Flax.		Tow.		Years.	Flax.		Tow.	
	Quantity.	Value.	Quantity.	Value.		Quantity.	Value.	Quantity.	Value.
	Tons.		*Tons.*			*Tons.*		*Tons.*	
1749......	9,029	$555,500	1,117	$20,500	1866.....	86,310	9,591,088	14,364	977,674
1758-1760.	9,861	622,500	332	5,500	1867.....	89,244	....	9,792	....
1778-1780.	10,291	902,500	483	8,500	1868.....	130,644	14,515,054	16,818	1,146,814
1790-1792	20,082	1,567,500	508	16,000	1869	107,532	16,428,568	19,206	1,334,082
1802-1804.	23,212	2,597,500	1,137	(*)	1870.....	196,876	28,548,984	20,358	1,413,698
1814-1815.	19,798	2,226,500	839	33,000	1871.....	163,890	23,791,384	16,740	1,162,206
1820-1821.	29,282	3,553,500	1,524	59,000	1872.....	130,302	18,957,197	13,968	1,404,201
1824-1826	38,942	4,488,500	1,626	62,500	1873.....	162,738	20,376,891	10,498	881,093
1833-1835.	33,325	3,239,500	5,997	296,000	1874.....	179,820	24,147,927	12,456	1,020,347
1842-1844	62,441	4,656,500	8,293	325,500	1875.....	170,118	23,140,803	11,520	1,026,498
1845-1847	45,279	4,075,500	12,127	568,500	1876.....	122,796	16,420,746	9,918	1,354,061
1848-1850	76,337	5,092,000	10,230	419,000	1877.....	201,780	31,589,978	11,142	1,720,397
1851-1853	67,354	5,262,500	13,218	529,500	1878.....	175,320	28,259,708	9,000	1,688,593
1854-1856	43,701	....	9,155	....	1879.....	202,608	34,834,536	23,076	2,221,357
1857......	32,980	7,567,025	17,010	727,293	1880.....	172,656	27,785,039	27,558	2,627,243
1858......	69,861	6,825,332	11,574	543,270	1881.....	233,086	34,891,503	33,408	3,454,576
1859......	50,784	6,603,870	19,828	1,184,755	1882.....	218,894	32,742,254	27,108	2,726,727
1860......	71,370	7,791,405	10,062	652,972	1883.....	197,442	28,422,849	26,784	2,701,716
1861......	61,560	6,788,099	15,087	921,312	1884.....	200,052	29,364,021	30,024	3,037,750
1862......	75,569	8,241,998	14,616	891,592	1885.....	168,372	23,108,624	34,812	2,943,668
1863......	75,636	8,271,665	14,166	966,370	1886.....	127,998	19,304,790	27,216	2,262,062
1864......	76,320	7,942,518	14,598	1,118,989	1887.....	153,918	23,797,500	45,138	2,721,098
1865......	116,784	12,975,016	14,040	960,066					

* Included in the flax.

As can be seen the export of flax according to its quantity and price varies greatly. For instance, from 1830 to 1840, from 1850 to 1855, in 1874–1877, and also in the last three years the export of flax visibly decreased, but in general the Russian participation in the supply of the western Europe mills with raw material increased rapidly only for the period 1861 to 1881, in quantity only four times, and in price more than five times. The decrease of flax for the last years must be regarded as temporary. The reason can be explained in that the high prices paid for cereals in the first part of the last ten years caused many of the proprietors to abandon the cultivation of flax for that of cereals. The amount of flax exported in 1887 already proves a return to the former output. With regard to flax-tow it must also be said that its export has also increased, but in a much smaller proportion than that of flax proper. Lastly, the value of flax fiber and its manufactures can be seen in the following table:

Years.	Flax yarn.	Sail cloth.	Flemish linen.	Ravens-duck.	Toweling.	Crash.	Table linen
1860	$7,500	127,500,000	$14,400,000	$53,900,000	$5,000	$256,850,000	$20,150,000
1865	11,250,000	51,350,000	26,900,000	59,700,000	12,450,000	613,000,000	50,900,000
1870	957,500,000	147,300,000	1,400,000	22,200,000	....	232,750,000	151,700,000
1875	123,300,000	56,300,000	25,000	14,500,000	800,000	136,600,000	45,250,000
1880	47,600,000	82,132,000	200,000	9,600,000	....	304,350,000	128,550,000
1885	80,300,000	54,800,000	1,450,000	13,859,000	3,150,000	221,550,000	(?)

Therefore the exports of flax products have not increased, but have decreased, forming for the last years not more than one-fifth of the value of manufactures of the same kind imported from abroad.

The table below shows from what ports or frontiers of Russia the flax fiber has been exported during the five-year period 1857–1861 compared with the years 1885, 1886, and 1887.

Description.	1857–1861.	1885.	1886.	1887.
	Tons.	*Tons.*	*Tons.*	*Tons.*
White Sea:				
Flax	5, 776	4, 938	2, 426	1, 656
Tow	5, 147	3, 269	1, 708	936
Baltic Sea:				
Flax	60, 161	90, 854	70, 265	92, 808
Tow	7, 836	24, 478	19, 469	2[illegible], 878
Black Sea:				
Flax	1	....	3, 316	....
Tow	0	....	....	....
Western land frontiers:				
Flax	3, 197	72, 440	51, 422	59, 454
Tow	1, 337	6, 658	5, 885	9, 324

Thus it is seen that the exports from the Baltic Sea, and especially by the land frontiers, have greatly increased; by the White Sea the export has decreased, and in the Black Sea it is only occasional. A small quantity of flax is exported to Finland and by the Asiatic frontier. In 1886, 334 tons of flax and 459 tons of tow were sent to Finland, and 221 tons of flax and about 1 ton of tow were exported by the Asiatic frontier.

The following table shows the amounts of flax exported abroad from 1884 to 1886 and through what custom-houses it passed:

Custom-houses.	1884.	1885.	1886.	Average.
	Tons.	*Tons.*	*Tons.*	*Tons.*
Verjbalow	65, 899	18, 884	35, 978	50, 250
Riga	53, 068	50, 517	35, 583	46, 330
Pernau	18, 152	16, 313	8, 287	14, 251
St. Petersburg	14, 177	14, 393	11, 747	13, 439
Reval	12, 521	7, 164	8, 380	9, 491
Graeff	11, 587	7, 771	4, 158	7, 830
Sosnovitz	5, 940	7, 755	6, 053	6, 583
Archangel	4, 808	4, 938	2, 430	4, 050
Libau	838	2, 466	5, 716	3, 053
Kretingensen	2, 812	2, 645	1, 068	2, 175
Gorjdow	2, 449	1, 978	1, 708	2, 045
Granitsa	2, 403	2, 168	1, 408	1, 993
Olssian	991	473	528	662
Alexandrow	261	576	47	295
Vladislavow	105	93	142	113
Taoweogen	154	23	55	77
Yourburg	77	13	36	42

In 1887, the export from Riga amounted to 49,176 tons. From Verjbalow, 36,144 tons; from Reval, 21,888 tons; from Graeva, 12,114 tons; from St. Petersburg 8730 tons; from Sosnovitz, 5,184 tons; and from Libau, 2,356 tons.

The following table shows to what countries Russian flax is principally exported; it being understood that much of the exports to England are really destined to the United States:

Exported to—	1884.	1885.	1886.	1887.
	Tons.	*Tons.*	*Tons.*	*Tons.*
Germany	89,434	65,458	48,665	61,938
England	55,383	57,582	36,503	56,658
France	32,906	21,700	20,392	20,754
Austria-Hungary	8,600	10,095	3,457	1,926
Holland	1,699	279	3,410	....
Belgium	9,016	10,880	10,489	12,636

The countries to which tow is most largely exported and the respective amounts are shown in the following table:

Exported to—	1884.	1885.	1886.	1887.
	Tons.	*Tons.*	*Tons.*	*Tons.*
England	11,907	17,208	15,372	17,550
Germany	7,041	9,076	7,080	11,268
France	5,045	3,193	960	1,179
Belgium	3,113	2,213	1,764	?
Holland	1,406	559	302	?
Denmark	126	1,177	773	?

So it is seen that most of Russian flax fiber is exported to Germany whereas the greatest purchaser of Russian tow is England. Formerly both the flax fiber and tow went principally to England, so that in the ten-year period from 1857 to 1866, from the total quantity, there was exported:

To—	Flax.	Tow.
	Per cent.	*Per cent.*
England	71	78
Germany	7	13
France	6	1
Holland and Belgium	5	3
Norway and Sweden	1	1
Denmark	1	0

Consequently the flourishing manufactories of England required three-fourths of the flax tow exported from Russia, whereas the German manufacturers demanded very little. But from the year 1870, Germany has rapidly increased its manufactures of flax goods and is to-day the first on the list.

As has already been stated above, Russia supplies almost all the countries with flax. Of the total amount of flax imported into Germany, Russian flax represented 87.1 to 94.2 per cent. from 1880 to 1884, about 88.6 per cent. in 1885, and about 85.4 per cent. in 1886.

The percentage of Russian flax imported into England, compared with the total import of flax into England, was, for 1886, 63 per cent.,

and for 1887, 74 per cent. · And these percentages are almost the same in the other countries of Europe. Generally speaking, notwithstanding the great competition brought to flax by cotton, it may be stated that the Russian flax industry has nothing to fear whatever in this industry, which will still flourish, especially if proper means are employed to improve its manipulation.

The export of flaxseed, like that of flax fiber has also increased, although it may be said that these two products have nothing to do one with the other; as for instance in the southern provinces no account of the fiber is taken, whereas in the northern region the crop of flax fiber may be abundant and that of flaxseed nothing.

There is no exact information relative to the export of flaxseed up to 1827, because up to that period flaxseed was not classified separately in the report of interior commerce. From 1827 to 1887 the average amounts of flaxseed exported per periods of 5 years were as follows:

Period.	Quantities.	Period.	Quantities.
	Bushels.		*Bushels.*
1827–'31	3, 620, 184	1862–'66	8, 588, 682
1832–'36	3, 333, 482	1867–'71	14, 159, 442
1837–'41	5, 567, 484	1872–'76	14, 658, 080
1842–'46	6, 672, 918	1877–'81	14, 655, 162
1847–'51	7, 537, 938	1882–'86	10, 451, 172
1852–'56	8, 343, 936	1887	13, 146, 000
1857–'61	8, 688, 984		

As is seen, the gradual increase of foreign export continued until the eighties. In 1882 a larger amount of flaxseed was exported than had been exported for many years, while in 1885 it was quite insignificant and only amounted to 3,940,490 bushels. In 1886 the exports appeared somewhat improved, and in 1887 it again attained the figure which is only a little less than for the 5-year period, 1877–'81. The following table, however, will better demonstrate the variations in the exports of the flaxseed:

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Tons.			*Tons.*	
1870	366, 422	$13, 571, 190	1879	480, 557	$20, 538, 296
1871	388, 030	14, 371, 506	1880	402, 570	18, 638, 681
1872	364, 517	11, 146, 773	1881	383, 505	16, 138, 723
1873	393, 655	13, 858, 444	1882	470, 772	18, 623, 698
1874	461, 869	15, 883, 831	1883	364, 715	14, 965, 206
1875	413, 630	14, 348, 227	1884	270, 560	10, 749, 221
1876	344, 492	11, 902, 369	1885	109, 093	4, 332, 650
1877	266, 900	11, 361, 032	1886	183, 767	7, 362, 433
1878	435, 813	17, 959, 686	1887	354, 960	13, 435, 500

The division of the amount of flaxseed exported from Russia, passing through the different custom-houses of Russia, is as follows:

Frontiers.	1884.	1885.	1886.	1887.
	Tons.	*Tons.*	*Tons.*	*Tons.*
White Sea	10, 347	176	954	6, 796
Baltic Sea	112, 561	66, 229	99, 023	236, 668
Russo-German	22, 205	13, 808	20, 067	
Russo-Austrian	11, 602	1, 043	1, 418	21, 240
Russo-Roumanian	....	1	156	
Black Sea	35, 619	6, 193	27, 810	103, 266
Azof Sea	87, 638	21, 554	34, 349	
Finland	9	191	212	(?)
Asiatic	741	495	2, 243	(?)

The principal ports through which the flaxseed passes going abroad are Riga, Libau, St. Petersburg, Revel, Rostoff, Odessa, and Nicolaieff, and the principal land frontiers are the Warsaw frontier and those of Verybaloff and Sosnovitz.

The amounts of flaxseed exported from Russia during the last 4 years were directed to the following countries:

Countries.	1884.	1885.	1886.	1887.
	Tons.	*Tons.*	*Tons.*	*Tons.*
England	164, 557	53, 500	86, 639	199, 602
Germany	32, 509	22, 067	29, 681	41, 400
Holland	27, 406	13, 142	82, 897	45, 432
Belgium	16, 517	12, 039	25, 488	38, 106
France	10, 725	2, 900	3, 161	4, 496
Denmark	7, 418	891	3, 321	(?)

Besides flaxseed, flax oil and residue are exported, but as the latter are not specially classified in the "report of the interior commerce," but are condensed with the same products obtained from hempseed and sunflower seed, the figures below must be considered as much above the reality:

Year.	Flaxseed oil.		Flaxseed residue.	
	Quantity.	Value.	Quantity.	Value.
	Tons.		*Tons.*	
1870	37	$4, 162	12, 045	$334, 558
1871	100	11, 106	12, 776	354, 963
1872	327	44, 499	16, 462	439, 750
1873	222	26, 779	15, 368	408, 599
1874	974	101, 465	17, 454	421, 360
1875	222	24, 635	19, 857	409, 581
1876	330	40, 646	27, 748	698, 825
1877	140	20, 344	25, 566	659, 771
1878	305	60, 493	26, 961	650, 312
1879	139	17, 050	30, 043	748, 843
1880	548	70, 514	30. 507	880, 542
1881	35	4, 099	30, 895	911, 006
1882	156	25, 161	48, 825	1, 439, 428
1883	....	....	74, 602	2, 239, 980
1884	....	....	196, 166	2, 483, 845
1885	120	16, 454	102, 301	2, 474, 967
1886	103	14, 707	86, 583	1, 921, 921
1887	29	3, 500	97, 812	2, 074, 500

As is seen, the exports of flaxseed varies very greatly from year to year, whereas the export of residue not only increases, but seems to have a progressive increase. The largest amount of residue exported is directed to England, and next in order to Germany, Denmark, Belgium, Switzerland, and France.

If the value of all the flax products be added together, it appears that the average for the last few years amounts to about $45,000,000. In 1856–'60 this amount was only about $14,500,000; in 1861–'65, it was $17,000,000; in 1866–'70 it was $29,000,000; in 1871–'75 it was $39,000,000 and in 1876–'80 it was $46,000,000. Therefore flax and its products amount to about one-sixth of all the goods exported from Russia, showing conclusively that the flax industry merits full attention, not only as an object of revenue for the proprietors, but also as one of the principal national industries of the empire.

J. M. CRAWFORD,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
St. Petersburg, February 10, 1891.

FLAX CULTURE IN RUSSIA.

REPORT BY CONSUL HEENAN, OF ODESSA.

Flax is cultivated in all parts of European Russia for local consumption, but it has an importance for manufacture only in twenty-three governments, which sow more than 3,105,000 acres in flax, the remaining twenty-seven governments showing less than 675,000 acres. With regard to the object for which flax is sown European Russia can be divided into two regions—the northern and the southern. In the first flax is sown chiefly to obtain the fiber, although with the fiber seed is also obtained; and in the second nearly exclusively for the seed. The northern region of the cultivation of flax for manufacturing purposes extends from the southeastern part of the Baltic Sea to the central part of the Ural Mountains, within which are the governments of Livonia, Kovno, Vilna (Vitebsk, Pskov, Smolensk, Tver, Yaroslav, Vladimir, Nizhnee-Novgorod, Kostroma, Vologda, Viatka, and Perm. More flax is cultivated in the governments of Viatka and Pskov than in the others. In the first about 251,000 acres are sown into flax, and in the second about 221,000 acres. These two provinces may be considered as the centers of the cultivation of flax, around which the other flax-producing provinces are grouped. The yield of flax per acre in these provinces is very different, and depends on the quality of the soil in which the flax is sown. An acre of good land gives 400 pounds or more of fiber and from 400 to 535 pounds of seed, but an acre of poor, exhausted soil will not yield more than 160 to 200 pounds of fiber and about 265 pounds of seed. The average yield for the entire region may

be considered to be from 265 to 330 pounds of flax fiber and 400 pounds of flaxseed per acre.

The southern region of the cultivation of flax for the sake of the seed consists of the following territory and governments: The Don-Cossack territory, sowing 262,000 acres; Yekaterinoslav government, sowing 251,000 acres; Kherson government, sowing 175,000 acres; Taurida (Crimea), Samara, Saratov, Voronezh, Tambov, and Poltava. In the last two provinces flax is grow both for the seed and fiber. Flax for the seed is mostly sown either in virgin soil or in old fallow lands. The yield of seed in this region varies from 400 to 670 pounds and more per acre, and for an average may be estimated to be about 535 pounds per acre. The total harvest of flaxseed for all of European Russia attains to about 1,800,000,000 pounds. Considering the average value of the flax fiber to be $186 per ton and that of the seed to be $44.10 per ton, it will be seen that value or gain to Russia from the cultivation of flax is about $112,000,000 annually.

The advantages derived from the cultivation of flax would be far more if the qualities of the Russian fiber would correspond with its quantities and if a larger portion of it were to be exported in a manufactured state. As regards its quality, Russian flax is not only surpassed by Irish flax, but also by the flax of many other countries of western Europe (Belgian, Dutch, French, and Bohemian), and is valued in foreign markets lower than any other flax. The low qualities of the Russian fiber are not the result of natural causes, but of the ignorance as to the proper method of treating the flax. The cultivators of flax are chiefly peasants, who partly do not know and partly do not possess the means to acquire the latest improvements in the primary technical manipulation of the fiber. Another cause of the imperfect working out of the flax is to be found in the absence of a home demand for a high quality of fiber. Russian factories do not produce linen from the finest numbers of spun thread, and therefore do not require the highest class of flax. This latter circumstance is unfortunate, as it is a strong impediment to improvements in the manipulation of the flax fiber.

The aim of the producer is a large quantity rather than an improved quality, and the result is a progressive reduction in the qualities of the fiber. Of late years this has become particularly apparent in the government of Pskov. Formerly Pskov flax had a high reputation all over Russia, but now it is quoted much lower than flax from Velogda, Kostroma, Yaroslav, and Tver. About one-half of the flax fiber produced in Russia is exported abroad only half worked (the unbrushed fiber together with the tow), and the greater part of the fiber remaining in the empire is worked up by the peasants in their farmhouses into thread and linen for their own use, as well as for sale. A much smaller part of the flax goes to the spinning and weaving factories, which are chiefly situated in the governments of Vladimeer, Kostroma, and Yaroslav.

As regards the internal or home trade of flax, it is almost entirely in the hands of small dealers, who drive from village to village and make their purchases in small lots. The flax thus collected is then sent in considerable quantities to the towns which serve as centers to the flax trade. In the western part of the northern region the most important centers of the flax trade are Poneviezh (government of Kovno), Dünaburg (government of Vitebsk), Pskov, Ostrov, Opochka, and the hamlet of Soltsy (government of Pskov). From Poneviezh and Dünaburg the flax is chiefly forwarded to Riga, and only a small quantity of it to Libau, and from Soltsy by rafts on the spring high water to St. Petersburg. The port of St. Petersburg receives the flax, tow, and linseed from Tver, Yaroslav, Kostroma, Vladimeer, and even from Vologda and Viatka. In the government of Tver the chief markets for the products of flax cultivation are Byetsk, Rzhev, and Kashin; in the government of Yaroslav, Ooglitch, Rostoff, and the village of Velikoje; in the government of Kostroma, Kostroma, Nerekhta, Kineshma, and Ples; in the government of Vladimeer, Melenki. From the three last-named governments only a small part of the flax is sent to St. Petersburg, the greater part being used up by the flax-spinning and linen-weaving factories. From the governments of Vologda and Viatka the bulk of the flax is forwarded to Archangel. The points where flax produce is collected for shipment by way of Archangel are: In the government of Vologda, Oostioog Velikee; in the government of Viatka, Viatka, Orlof, Slobodskoi, Kotelnik, Glazov, and Kukarka.

In the southern region the chief product of the cultivation of flax (linseed) goes direct by rail to the ports of Odessa, Rostoff, and Taganrog for exportation abroad. As regards the southeastern provinces of Samara, Saratov, and part of Tambov, they send their linseed by the water ways of the Volga and her system of canals to St. Petersburg.

The *Linum usitatissimum vulgare* and *crepitans* are being cultivated in Russia in several varieties of both kinds, but the difference in these varieties is so slight and they so easily blend that even those initiated in the trade of the article often fail to perceive it. Both (*vulgare* and *crepitans*) have blue blossoms and occasionally white blossoms. The blue-blossom varieties are preferred. About 21,000,000 bushels of seed are annually raised in European Russia. The quantity exported was as follows:

	Bushels.
1887	13,000,000
1888	14,000,000
1889	13,500,000
1890 (estimated)	12,000,000

Of the total export of Russian oilseeds England receives (via Hull and London) 57 per cent.; Germany, about 14 per cent.; Holland, about 11 per cent.; and Belgium about 8 per cent. The most important markets for the sale of Russian flax fiber are Dundee, in Scotland; Lille, in France; Ghent and Antwerp, in Belgium.

Flaxseed, as understood in Russia, comprises sowing seed and crushing seed. The first named is a more carefully sorted quality, exported exclusively for sowing purposes. Crushing seed is the surplus seed of the flax plant, which is exported for making oil, etc., as there is no demand for it as sowing seed. With this quality the seed received from the interior is mixed and the whole exported as crushing seed. Of the total quantity exported, viz, 13,000,000 bushels, about two-thirds is described as sowing seed.

The seed is sown in April, May, and early in June. It is sown earlier in the south and southeast than in the center, west, and north; much depends whether the seasons are early or late. The harvest begins as early as July and as late as the months of August and September, earlier in the south and later in the north. The number of bushels of flaxseed raised per acre depends on the object to be attained; when the seed is the object a much less quantity is sown, per acre, and when the fiber is desired a much larger quantity is sown. In the south and east of Russia a little over a half bushel per acre is sown, and the yield is about 10 bushels. In those parts of central Russia where the fiber is not utilized a little over four-fifths of a bushel is sown, and the yield is about 10 bushels. In western Russia and those parts of central Russia where the fiber is utilized, 1 to 1½ bushels per acre are sown, and about 5 bushels is the yield. In northern Russia, where the fiber is the chief consideration, nearly 3 bushels per acre are sown, which gives about 6 bushels of seed and from 300 pounds to 600 pounds of fiber. This year's crop is above the average in quality, but less in quantity than any year since 1885. The seed is ready for export in the months of September, October, and November in the south, and from northern and central Russia often not before March of the following year.

Flaxseed is exported from Riga, Libau, Pernau, St. Petersburg, Rostoff-on-Don, Odessa, Nicoliaev, Sevastopol, Mariopol, Taganrog, Berdiansk, and other ports by water, and also in large quantities by rail to Germany and Austria. Flaxseed is usually sown by hand, and the land should be carefully prepared and be of good quality. The plowing should not be less than 9 inches in depth, and the land should be as free as possible from weeds and thoroughly prepared beforehand for the reception of the seed; after the sowing, the seed is covered by passing a harrow once or twice over the ground. Moist and mild weather favors the development of the plant in all of its parts; a hot and dry climate, with occasional showers, will produce a good development of the seed, but the fiber is usually coarse and brittle, as the lignin parts of the stems then develop at the expense of the fiber. The cultivation of flax, whether for seed or fiber, requires for its proper development a rich black loam (10 to 14 inches) having a clay subsoil; good crops, however, are grown where the subsoil is gravel or gray sand. Flax is grown in nearly every province of European Russia.

The working up of the flax fiber is carried out by the so-called flax-

breaking or flax-swinging, and further by flax-spinning and linen-weaving, factories. The total number of flax-swinging factories is 59; of flax-spinning factories, 20; of linen-weaving factories, 88. These factories produce annually goods valued at $20,000,000 and over, which are made entirely from the flax fiber. Much linen and thread is made yearly by the peasantry at their homes, the value of which can not be obtained. About $5,000,000 worth of linseed oil is manufactured and consumed annually in Russia, a very small quantity being exported. Oil cake, the product of flaxseed, is exported to the value of about $2,500,000 yearly. The lesson to American farmers, especially those of the Northwest, which the total product of the cultivation of flax in Russia furnishes will be readily appreciated and understood. The possibilities which the cultivation of the flax fiber offers to Western farmers is only equaled by the surprise that such possibilities have thus far been neglected, if, indeed, they were not altogether unknown. The seed has been cultivated with more or less satisfactory results in the United States, but the fiber practically not at all. The climate, soil, and conditions generally throughout the Northwest are very favorable to the cultivation of the flax fiber as well as the seed. After a short experience, as to the primary manipulation or handling of the flax fiber, our farmers would produce flax which would compare favorably with the best varieties of the fiber. It seems strange that a practical people like ourselves should for years have been satisfied to cultivate flax for the seed at a value of about $15 per acre, and at the same time we allow 600 pounds of flax fiber per acre to rot on the ground, this flax fiber having a value, after being manipulated, of $186 per ton.

Familiar as our farmers are with the working of improved and expensive agricultural machinery and the latest developments of the human intellect as applied to the soil, they may always learn something by watching the working of rude ideas as seen in a primitive and unsophisticated people. The main difference between the old and the new system of farming is not one of method, but of expense; and, as physicians never really know what a disease is capable of until they see an outbreak in virgin soil, so it is not possible to fathom all the possibilities of the most commonplace notions and devices until we see them applied with the unconventional freedom and simple directness that belong to comparatively primitive peoples. The Russian peasant is both simple-minded and ignorant; he clings to old methods as much from liking as for the expense which new methods involve. From the flax fiber, by the aid of his primitive and rude contrivance, the Russian peasant produces linen, thread, crash, and other valuable and necessary articles for the use of his family and for sale. It does not require the aid of expensive machinery to make the flax fiber either useful or valuable. The rude machines which the Russian peasant employs are the handiwork of some village carpenter or wheelwright, and are made at a comparatively small cost. If the Russian peasant farmer

accomplishes such results, the American farmers, who possess like conditions of climate and soil, should accomplish much more. The unsatisfactory condition of the farmers in our Northwestern States, which is certainly due to the overcultivation of wheat, with its yearly decreasing yield per acre, renders it all the more important that a speedy means be found to relieve a condition of things which affects the material interest and welfare of the great majority of the people of the United States. Such a means exists in the flax plant. It will not only enable farmers to make their own linen, rope, thread, crash toweling, oil cake, and much besides, but will cause new industries to be established throughout the country in districts where the advent would be both profitable and new. There should be a general and persistent effort made to encourage the cultivation of the flax fiber throughout the United States, with the view of establishing factories for the manufacture of twine or textiles, and, if this report should develop a proper interest in so important a subject, the result can not fail to be satisfactory.

FLAX PRODUCT OF EUROPE.

In no country of the world does the cultivation of flax attain such large dimensions as in Russia. Russia alone produces more flax than all the other countries of Europe combined. Exact statistical data regarding the annually obtained products from the cultivation of flax are not compiled either in western Europe or in Russia. There are only approximate valuations, based upon the knowledge of the area which is occupied under the cultivation of flax and of the average yield per acre. Out of the total area sown in Europe with flax, and amounting to about 5,700,000 acres, more than 3,700,000 acres are sown in Russia. Notice must at the same time be taken of the fact that, while in all European countries without exception the area of land under the cultivation of flax is being annually more and more reduced, it is in Russia, on the contrary, being increased. The total quantity of flax fiber produced in the whole of Europe is estimated to be 1,354,000,000 pounds, distributed as follows:

Countries.	Quantity.	Countries.	Quantity.
	Pounds.		*Pounds.*
Russia	900,000,000	Ireland	46,800,000
Austria-Hungary	104,400,000	Belgium	43,200,000
Germany	97,200,000	Italy	43,200,000
France	79,200,000	All other countries	36,000,000

Thus the share which Russia has in the total quantity of flax fiber produced in all Europe is exactly two-thirds.

THOS. E. HEENAN,
Consul.

UNITED STATES CONSULATE,
Odessa, January 17, 1891.

DECLINE OF THE IRISH FLAX INDUSTRY.

REPORT BY COMMERCIAL AGENT SMYTH, OF HUDDERSFIELD.

A steady decline in the flax industry of Ireland is noted, notwithstanding the repeated efforts of late years to revive it. Strange as it may seem, however, Belfast still maintains its prominence in the linen trade, while for years the native sources from which it was accustomed to draw its supplies of fiber have been contracting and growing less, so that to-day we find its manufacturers importing from the Continent millions of pounds' worth annually. It is not within the province of this report to discuss the economic causes which have produced such a serious revolution in the commerce of the country, for such a discussion would only lead to the consideration of systems and questions which may not properly come under consular review. While Belfast to-day exports its linen products to all countries of the globe, the material benefits of its trade have a local application only, instead of being felt throughout every section of the country where a pound of flax can be raised. This is the result of those singular conditions which have been forced upon the people by direct legislation, and which have gradually destroyed all the native industries and driven their natural products off the face of the land. It has been ascertained by Professor Sullivan, of Cork, that the soil and climate of Ireland can not be excelled for the production of flax, and yet Belgium, Russia, and Holland supply millions' worth of the fiber every year to the linen manufacturers of Belfast. It is said on good authority that, were the internal affairs of the country properly managed and this important industry properly encouraged and supported, the Irish flax producers would soon be able to drive their foreign competitors out of the market and turn to their account every year from $50,000,000 to $75,000,000. It would also enable them to export a large quantity of flax of a superior grade.

In an interesting article on this subject Professor Sullivan writes:

> I have examined all the soils of Europe and of nineteen American States; none of all these possesses the properties for the production of fiber equal to the soil of Ireland.

A writer in one of the magazines for March takes up the subject, and locates the cause of failure among the farmers themselves, charging their methods with the greatest part of it. It must be remembered that these very causes are in themselves but the effects of other causes which invoke conditions and circumstances which are, unfortunately, a part of the political management of the country. The poor farmer is always found between forces, which, operating like millstones, have ground the very life out of him, until there is very little of either him or his name left in the country. He gets none of that encouragement of material aid that might enable him to elevate either himself or his methods in the struggle against superior powers and superior advan-

tages. Hence he is left to toil and spin in vain, while the Dutch and the Belgians and the far-off Russians step in with their products and carry off the money that should flow into his pockets to improve his lot, enrich his country, or brighten his own home.

It is contended in this magazine article that the failure of the Irish flax in the native market can be explained only by the defective way in which the crop is cultivated. The writer says:

In Ireland the farmers produce the crop and prepare it for the cloth manufacturer. In Belgium, in Holland, and in Russia, on the other hand, the farmer concerns himself solely with the cultivation of the crop. The preparation of the fiber is in the hands of persons specially skilled and trained in the work. The continuance in Ireland of the old system is known to entail much loss and waste, while it is seemingly on account of the greater efficiency and higher quality arising from the division of labor that the Belfast manufacturers so frequently prefer the foreign to the home-grown article. After the farmer has sown the seed and gathered the crop several processes remain before the flax can be used in the cloth mills. The most important are technically known as "steeping" and "scutching." By steeping is generally meant sinking the straw in deep water. Different methods of steeping prevail in different countries, according to local circumstances. In Holland stones are scarce, so the flax has to be laid on the surface of the water and then covered with mud raked up from the bottom of the water. The finest flax in the world comes from Courtrai, in Belgium, where the fiber is steeped in the River Lys, whose velocity is only at the rate of 3 miles an hour. The straw is sunk packed in crates, and for many miles both banks of the river are used as steeping grounds. In Russia, on the other hand, the flax is merely spread upon the ground and the rain is left to do the steeping. On Irish flax farms the straw is thrown into pits or wells with the seed still on it, the farmers not having learned the continental trick of saving the seed and yet getting good fiber. Much expense is consequently incurred in obtaining seed from abroad. On the Continent, too, the method of "scutching" is widely different, the yield of fiber being usually wider and better. So general is the necessary technical knowledge, that in the scutching mills the labor is mostly that of girls and lads from 17 to 20 years old, instead of men, as in Ireland, earning 30*s.* a week. Both the cheapness and the efficiency of the labor is said to be due to the separation of the functions of the producer from what are really those of the manufacturer.

There are two methods by which this is accomplished: The farmer may buy the seed and sow it on his land in order to sell it to the factor, who will prepare the flax for the market; the factor, on the other hand, may himself provide the seeds and hire the land from the farmer, whose remuneration for preparing the land, sowing the seed, etc., will be included in the rent. It is to the adoption of one or the other of these plans that some people in Ireland are looking for a revival of what should be one of its most important industries. At the present time the crop is only cultivated to any extent in seven out of thirty-two counties, the production of flax in all the southern counties being quite insignificant. The average crop of the seven counties is worth £800,000 per annum; so that if the other twenty-five counties were producers in the same proportion, Ireland's flax industry, regardless of the seed that should be saved under an improved system, which would of itself represent a considerable sum, could be made to realize an income of between £3,000,000 and £4,000,000 yearly. As a matter of fact, the experts are of opinion that with its well-watered valleys the south of Ireland is even better adapted to the production of flax than the north. Before the farmers of the south can supply Belfast market with fiber equal to that which is now imported from across the seas, there must, it is thought, be some intermediate agency by which the preparatory process could be undertaken. Some 2 years ago a Belfast manufacturer made a very successful experiment with flax-growing in the south on

the continental system. He rented 60 acres of land near Cork, which he had prepared for a flax crop; last season the land yielded 80 stones of fiber of the value of 10s. per stone and seed to the value of £6 per acre, the profit being over 300 per cent. This is probably an exceptionally favorable result, but it certainly shows that under proper conditions the production of flax in the southern part of the island can be made to yield wealth beyond the Irish farmers' dreams of avarice.

It is proposed to give the continental system a trial in Tipperary. Mr. Dickson, a member of Parliament, has guarantied a fund to start it with 100 acres. Its success would undoubtedly lead to the revival of a very important industry for the Irish people.

WILLIAM P. SMYTH,
Commercial Agent.

UNITED STATES COMMERCIAL AGENCY,
Huddersfield, March 6, 1891.

NEW ZEALAND FLAX.

REPORT BY CONSUL GRIFFIN, OF AUCKLAND.

[From Consular Reports No. 11.]

New Zealand flax (*Phormium tenax*) is by far the most valuable fibrous plant indigenous to this colony. It has been an article for export ever since 1809.

The attention of Europeans was first directed to it by the great navigator, Captain Cook, who described it as something superior to either flax or hemp. The natives, or Maories, have for many years used it for binding together the framework of their houses, and for making clothing, baskets, fine mats, fishing nets and lines, and sails for their boats and canoes. The name *Phormium tenax* is derived from the Greek word *Phornos* (a basket), and *tenax* (strength). It belongs to the liliaceous family of plants, a species of plants whose history can be traced from the earliest ages. It is mentioned in the book of Exodus as one of the productions of Egypt in the time of the Pharaohs, and it has been ascertained that the cloth in which the Egyptians enfolded their mummies was made of this plant. Herodotus frequently refers to it, and mention is also made of it in the New Testament. Our Savior once selected one of the flowers of the *Lilium chalcedonicum* as an emblem of beauty.

Phormium tenax is sometimes called the flax lily. The leaf varies in size from 3 to 14 feet in length, and from one-half inch to 5 inches in breadth at the widest part. It grows in bunches or groups of plants; each shoot has five leaves. On an average, about ten of these shoots form a bunch. The leaves are perennial, hard, and sword shaped, with a stalk rising 5 or 6 feet above them bearing a profusion of yellow and sometimes red flowers, followed by triangular seed vessels filled with flat and thin black shining seed. The plant attains its full growth in 3

years, when the leaves generally split at the end, and it first comes into flower. It is said that in rich soil the flower rises to a height of 20 feet.

The leaves are smaller in structure than those of European flax and hemp plants, being composed of cellular trusses running the whole length of the leaf, incased in a green substance. The trusses consist of two parts, wood and bast, the latter forming the fiber so highly prized. The fibro-vascular bundles compose the inner bark of the plant, and serve to circulate the juices which are taken from the soil by the roots. They consist of exceedingly fine threads, one lapping over the other in such a manner as to give a free circulation throughout the leaf. The plant is indigenous only to New Zealand and Norfolk Island, although it has been transplanted in India and other countries, and is said to grow on the Pacific slope of the United States. It grows best in rich, moist, and well-drained ground. It reaches the greatest size on the banks of running streams.

When the leaves are full grown, the natives gather them when green and separate the fibers. They scrape the leaves with a shell, and then divide them with a comb. They are then put in the sun to dry, and when dry are perfectly white, soft, and silky to the touch.

It takes but little time to prepare the fiber; the plant may be shorn of its leaves in the morning, and before the sun is set the fibers are ready for weaving into cloth. The natives produce about 1 ton of fiber out of 4½ tons of green leaves. A full-grown plant will produce on an average about 36 leaves, besides offshoots from the roots, and it takes about six leaves to yield one ounce of fiber. At this estimate an acre of ground, planted 3 feet apart, would yield about 16 cwt. of fiber. When cultivated, the yield is about 2½ tons per acre.

DIFFERENT VARIETIES OF PHORMIUM TENAX.

The list of names of the different varieties of *Phormium tenax* distinguished by the natives is a very long one. It embraces *aonga*, a variegated flax described by Bishop Selwin; *atewhiki*, a very white fiber used for making fine mats and garments, the leaf is narrow with a reddish tinge, edge and keel narrow, bright scarlet lines; *sapoto*, cultivated at Coromandel, Kawhia, and Waikata—glossy leaves, rather red at the edge, has a general orange-green appearance at a distance; *sarariki*, a species of very fine and soft texture used for making ornamented mats, the leaves tapering, of a dull olive-green, lighter on the other side, dark-red keel and edge, and a keel on the upper side, gradually shaded away. forming a dark-colored band one-eighth to three-eighths of an inch broad; about 2 or 3 inches of the point of the leaves are of the same dark color.

Two varieties of *Phormium tenax* are described in the New Zealand flora. Dr. Hochsetter makes the following classification:

Sihori, a cultivated kind; *suhari*, swamp flax; and *wharariki*, hill flax. The first named, *sihori*, is regarded as the best variety; it is used only for the finest work by the Maories; it seldom grows to a greater height than 5 feet. *Suhara*, or swamp flax, grows to a height of from 10 to 12 feet; it bears a red flower about half an inch longer than the *sihori*, the seed-pods are also larger, and the scape is of a dark-red color. This flax may be distinguished from the other species by its bright color, sturdiness, and the nature of its fiber. *Wharariki*, or hill flax, is said to possess but a small proportion of fiber, and that of a very coarse kind. It is said to be cultivated in the coldest parts of the South Island, but it does not appear to be used for manufacturing purposes.

DIFFICULTIES IN THE PREPARATION OF THE FIBER.

The greatest difficulty in the preparation of the fiber of *Phormium tenax* is to do away with the gummy or mucilaginous products found in the leaf. Captain Hutton is of the opinion that what is ordinarily spoken of as the gum is, in reality, at least three different products, viz: First, the gum on the outside of the lower part of the leaf; second, the bitter principle and mucilage contained in the cells of the leaf; third, the cement that binds the ultimate fibers together into bundles. He found, while experimenting, that the gum softens, but does not dissolve in cold water, and that it readily dissolves in boiling water. The bitter principle is easily overcome by cold water.

The cement dissolves in boiling water, and more quickly in alkalies. Acids which dissolve the gum have no effect upon the cement. Hutton says:

> The strength of the fibrous bundles depends entirely upon the cement that holds the ultimate fibers together; and if this is dissolved, either by hot water or alkali, the whole would separate into a mass of fluff, with no coherence or strength.

It appears from a report on the chemistry of *Phormium tenax*, by Prof. A. H. Church, that the fiber contains much matter soluble in water, or liable to change. This accounts for the decay of rope made with this material. Professor Church says that the use of a mixture of lubricating or machinery paraffine oil with wood tar seems to prevent the entrance of sea water and the proneness to change in phormium fiber. He suggests that the fiber should be immersed in sulphuric acid of the consistency of that used in the manufacture of vegetable parchment for the purpose of toughening and strengthening it. Professor Church is opposed to the use of akaline matters at a high temperature in the treatment of the fiber, from the fact that it tends to destroy the oil and otherwise injure the fiber. He does not think that the ultimate fibers are held together by any cement, but by their cell walls.

STRENGTH OF NEW ZEALAND FLAX.

New Zealand flax is generally supposed to be the strongest fiber in the world, but such is not the case. Recent experiments with testing

machines show that, while it is more than double the strength of ordinary hemp and flax it is not as strong as silk.

I give below a table furnished me by Mr. S. Cheeseman, of the New Zealand Institute, showing the comparative strength of various kinds of fibers.

Table showing the strength of various fibers.

	Pounds.
Silk will bear a strain of	34
Phormium tenax, a strain of	$23\frac{7}{16}$
Russian hemp, a strain of	$16\frac{3}{4}$
Common flax, a strain of	$11\frac{3}{4}$
Agave americana, a strain of	7

This table does not vary much from that given by Professor Lindley, which is as follows:

	Pounds.
Silk will bear a strain of	34
Phormium tenax, a strain of	23
European hemp, a strain of	16
European flax, a strain of	11

EXPORT OF FLAX.

In 1837 there was exported from New Zealand 1,062 tons of *Phormium tenax*, the value of which was $106,200. In 1864 the export increased to 2,228 tons, with a value of $302,950. The largest export occurred in the year 1873, when the quantity was 6,454 tons and the value $718,975.

I give below a table showing the quantity and value of flax exported from New Zealand for each year since 1871:

Table showing the quantity and value of Phormium tenax exported from the various ports of New Zealand for each year from 1869 to 1880, inclusive.

Years.	Quantity.	Value.	Years.	Quantity.	Value.
1871	4,248	$453,055	1876	897	$91,425
1872	3,987	497,025	1877	1,053	94,130
1873	6,454	718,975	1878	622	53,331
1874	2,038	188,450	1879	445	39,370
1875	639	58,710	1880	894	78,085

FLAX MILLS.

The latest complete returns I have of the number of flax mills in New Zealand is for the year 1878. During that year most of the mills were worked for only a portion of the year. The industry, owing to the low price realized for dressed flax, was in a declining state. I append hereto a table showing the number of flax mills in operation during the year ending March, 1878, with the number of machines, the power and num-

ber of hands employed, and the quantity of flax manufactured during the year.

Provisional districts.	No. of mills.	No. of machines.	Horse-power.	Employés.	Quantity manufactured.
					Tons.
Auckland	19	25	134	172	642
Wellington	1	1	14	4	10
Marlborough	5	6	45	86	297
Nelson	1	1	30	12	60
Canterbury	2	4	9	28	165
Otago	3	3	19	10	16
Total	31	40	251	262	1,190

It will be seen from this table that Auckland has a larger number of flax mills than all the other provincial districts of the colony put together. I am informed by Mr. J. M. King, who is now engaged in compiling the census returns of Auckland for the year ending April, 1881, that the returns indicate a more prosperous condition of the flax mills than the colony has enjoyed since 1874, and that the number of mills and hands employed therein are largely in excess of those of 1880. These mills are used principally for dressing the flax for rope making.

I learn from the commissioners' report on flax that the green leaves are stripped by revolving rollers with projecting beaters traveling at a high rate of speed, which crush the epidermis against a fixed plate, so set as to allow room for the fiber to remain intact. The fiber, thus freed from the leaf of the plant, is washed by various methods, put on the ground or on lines to dry and bleach, finished by an arm or barrel scutch, and, when boiled, is ready for market.

All the machines used are identical in principle and vary only in the details by which the principle is carried out. This principle is that the leaf is held between horizontal feed rollers, revolving at a certain speed, while, as the leaf passes out from them, a drum armed in its circumference with iron beaters, and revolving more rapidly than the feed rollers, strips the epidermis and tissues away from the fiber, means being provided for adjusting the beating drum to a proper distance from the roller or bar against which the phormium leaf is stripped, so that the leaf may neither on the one hand pass through without being crushed, nor, on the other, have the fibers cut.

PREPARATION OF THE FIBER BY THE NATIVES.

The method of preparing the fiber by machinery is certainly a great improvement over that of the Maoris, because the waste is nothing like so great. Indeed, the Maoris do not obtain from each leaf one-fourth of the quantity that would be secured in machine dressing. The natives cut off the leaf about six inches below the point where the two blades adhere together and reject the colored edges; they so take much time

and pains in preparing the leaf, often soaking it four or five days in running water and then beat it with a stone or mallet. This process is repeated over and over again for four or five weeks. They can not be made to understand the value of time. It is certain, however, that the fiber dressed by the natives is far more valuable and beautiful than that prepared by machinery.

COMPETING FIBERS.

The principal competing fiber with *Phormium tenax* is manilla hemp, of which such vast quantities are used in the United States. Manilla hemp is a native of the Philippine Islands. It is made from a species of plantain called *Musa textiles*. It is planted generally on the slopes of hills, and requires shade and plenty of moisture. The trees are planted about eight feet apart, and are cut down at the end of the third year and made into fiber. A full-grown tree will yield about 1½ pounds of hemp.

It does not appear that machinery has ever been used successfully in its manufacture, although many inventions have been made for the purpose, but the hemp for the most part continues to be produced by manual labor.

The process of manufacture is described as follows: The tree is cut down and stripped of its linings; these are then cut into pieces three or four inches wide, after which they are drawn underneath an instrument resembling a saw fixed in a block of wood. The fleshy part of the cortex is scraped off, and the fiber alone remains, which is then placed in the sun to dry. Two persons, one engaged in cutting down the trees and stripping them and the other in extracting the fiber, can work up about 25 pounds of clean hemp in the course of one day. The greatest objection to rope made of New Zealand flax is that it becomes unfit for use after it is once wet, although there is no doubt that it will last longer than any other kind if kept dry. On the other hand, rope made from manilla hemp is actually improved by getting wet.

NEW ZEALAND FLAX IN THE AZORES.

Phormium tenax, I learn, is now being cultivated extensively in the Azore Islands. A company has been established there composed of two Englishmen and two Portuguese. One of the latter is stated to be the holder of a concession from the Government of a monopoly for the manufacture of this article throughout Portugal and all Portuguese possessions, which concession the company are to buy of him for £15,000 in shares, being one-half the nominal capital of the company, the vendor agreeing not to receive any dividend until the other 15,000 shares shall have received six per cent.

CULTIVATION OF FLAX IN NEW ZEALAND.

It is more than probable that the cultivation of *Phormium tenax* in New Zealand will soon become a profitable industry. The rapid spread

of colonization and the alienation of the waste lands of the crown to private proprietors have very much narrowed the source of supply of wild flax, which principally grows most luxuriently in soil that is selected by the settlers for agricultural purposes. Of course, as the stock of wild flax becomes scarce the necessity for cultivating the plant becomes greater. Experience proves that the wild flax will soon become insufficient for the demand, and due consideration must be given to the fact that flax, like nearly all other plants, can be improved by cultivation.

EXPORT OF FLAX TO THE UNITED STATES.

Very little New Zealand flax is shipped direct to the United States What reaches there generally goes by way of London. There was but one small direct shipment to America from Auckland in 1879, and none at all in the year 1880. The duty charged upon the imports of New Zealand flax into the United States is only $5 per ton, and ought not to interfere materially with its shipment to America. It may be, however, that it can not compete successfully with manilla or some of the various kinds of hemp grown in the United States.

G. W. GRIFFIN,
Consul.

UNITED STATES CONSULATE,
Auckland, June 15, 1881.

NEW ZEALAND FLAX.

REPORT BY CONSUL CONNOLLY, OF AUCKLAND.

[From Consular Reports No. 116.]

Inasmuch as flax fiber has become an article of considerable commercial importance in New Zealand during the past year, I have endeavored to procure some of the seed, which I forward herewith,* together with such information as I have been able to obtain in relation to the cultivation of the fiber. The purchase of New Zealand flax by the United States has largely exceeded that of any other country during 1889. I have therefore deemed it my duty, in view of the immense commercial value to which this exclusively New Zealand product has attained during the brief space of one year, to acquaint the Department of its growing importance as an article of export to the United States and other countries.

I am convinced that if handled with intelligence and care the *Phormium tenax* plant can be successfully and advantageously cultivated in the United States. The climate and swamps of many of the Southern States are peculiarly adapted to the propagation of New Zealand

* Sent to the Department of Agriculture.

flax. The climate of California is also suitable for the cultivation of the flax plant. *Phormium tenax* is indigenous to New Zealand, Norfolk Islands, Chatham Islands, and other smaller islands situate between between 30° and 50° south latitude. The most robust and finest plants are to be found between 35° and 41°. It grows on any soil from the sea-level to an altitude of 2,000 feet; but it is found in the greatest luxuriousness in swamps and on the banks of rivers and lakes. The leaf or blade often attains the length of 15 feet and from 2½ to 3 inches in width. Before the Maoris adopted European clothing considerable care was bestowed on the selection and cultivation of the plant by them. They dressed it by a process of steeping and scraping and hand scutching, which produced a fiber almost as fine and glossy as floss silk, of which they wove their mats and "kakahu" (clothing). But of late years, since the Maoris have learned they can procure their clothing from their European neighbors with much less effort than they could manufacture it with the primitive methods at their command, no steps have been taken for the conservation of the better varieties.

The seed accompanying this paper is of a superior quality, was procured for me by a Mr. Jeffs, who has lived in this colony for nearly 40 years and who is thoroughly familiar with the flax industry of New Zealand. It may be proper to state that Mr. C. K. Jeffs, of Onehunga, New Zealand, is willing to furnish seeds and practical information to any one desiring to engage in the cultivation of *Phormium tenax* in America. The seed above referred to was obtained from an old Maori cultivation, and is highly prized by those natives who still devote their attention to the weaving of mats and other useful ornaments manufactured from the fiber.

The flax used for export is usually cut from the swamps, marshes, and river banks. It is in its wild, uncultivated state, and it is cut down and run through the machines without any attempt at selection. This is much to be regretted, as with a little care, even with the crude machinery in use at present, a much finer article could be produced.

The persons usually employed to cut the green flax are paid by the ton. It is therefore to their interest to get as much weight as possible, and, in consequence, they cut as close to the ground as they can. The lower end of the leaf is thick and fleshy, containing a large amount of gum and vegetable matter, and weighs heavily as compared with upper portions of the leaf; besides, the fiber obtained from the butt end is very much inferior in texture to that procured from the body and top of the blade.

To imperfect machinery and carelessness in the selection of green plants may be ascribed the apparent coarseness and inferiority so often complained of in the flax exported from certain portions of New Zealand. But with improved flax-dressing machinery and proper care exercised in the selection of the raw material a very superior article can be produced. The *Phormium tenax* fiber is susceptible of a much higher de-

gree of preparation than has been bestowed upon it up to the present. This, however, is not altogether the fault of those who are engaged in its manufacture; it is for want of the necessary machinery. The hand-dressed article prepared by the natives is as fine as silk as compared with the modern machine-dressed flax of to-day. This only demonstates the fact that the fiber may be reduced to a much finer quality, and all that is necessary to do this is an improved machine. If the New Zealanders can not produce the requisite machinery I trust the inventive genius of America will come to the rescue. There is certainly a splendid opportunity and a fortune for any man who will invent a machine that will successfully and economically reduce New Zealand flax to a proper degree of fineness.

Many who profess to thoroughly understand the toughness and durability of the *Phormium tenax* believe that if it could be properly reduced it would enter largely and successfully into the manufacture of valuable textile fabrics.

The quantity of seed I have forwarded to the Department, I am reliably informed, is nearly sufficient for an acre of ground, and with ordinary care in its cultivation will be in proper condition to send to the "flax-mill" at the expiration of 3 years from the date it is put in the ground. It takes about twelve hundred healthy plants to the acre, and, to use Mr. Jeff's expressive language, "in 3 or 4 years it would be so close you would hardly be able to ride a horse through it."

For additional information on the subject reference to my report to the Department, dated December 31, 1889, may be of some value.

JNO. D. CONNOLLY,
Consul.

UNITED STATES CONSULATE,
Auckland, March 6, 1890.

LINSEED IN INDIA.

REPORT BY CONSUL-GENERAL MERRILL, OF CALCUTTA.

[From Consular Reports No. 126.]

The seed obtained from the cultivated plant *Linum usitatissimum* is known as linseed. The linseed cultivated in India up to altitudes of 6,000 feet above the sea is oil-yielding.

Experiments extending through years prove that the climate of this country is not as favorable as that of Europe for the production of the best flax fiber, also that a certain apathy or dislike of change among the peasantry will prevent the cultivation of this plant for anything but the seed. Though much has been done by the Government for the production of flax and hopefulness of success has been indulged, the result has not been commensurate with the efforts put forth nor with the hopes entertained. Jute holds the place of flax in popular favor.

Linseed is grown on all the different classes of soils comprised between the lighter clay and sandy loam. It does not do as well in stiff clay as in light sandy soils, but thrives on the heavy black cotton soil of which the level plans of this country are formed, similar to the land in southern Louisiana were there in this Mississippi delta a stronger admixture of clay. The valley lands receive three or four plowings and two or three harrowings. Linseed should not be buried deep; otherwise it will not germinate properly. The seeds are, therefore, not plowed in, but simply covered by passing a drag over the field once or twice. It can be sown alone or with wheat, grain, or mustard. Sometimes all of these crops are grown together. When sown with such a crop as grain or wheat, the plan adopted is this: After wheat or grain has been sown the land is plowed; linseed is now sown broadcast and the operation is finished by using the drag or ladder twice.

On the lighter clay land the method for growing linseed is the simplest imaginable. As soon as the rice field has become sufficiently dry, linseed is sown broadcast on the standing rice. The rice is harvested as usual, the linseed being left to be reaped about the last of March.

In some districts it is grown on land which is under water during the rains, and in this case its cultivation is of the roughest possible description, there being no preparatory plowing, but the seed being simply scattered over the ground and plowed in. Yet it is acknowledged that the land must be well drained, as stagnant water is very injurious to the crop. When linseed occupies the land alone, from 15 to 20 pounds of seed is used; but, when it divides the soil with other plants, only half as much is required.

Among the varieties of linseed there are two important kinds—the white and the red—which seem, in ordinary nomenclature, to be all-embracing. A slight preference is expressed for the former, as it is said to yield a little more oil and to yield it more easily than the latter, while the cake is softer and sweeter than that produced from the red seed.

It is impossible to arrive at definite information in regard to the actual area devoted to the cultivation of linseed, owing to the very general habit of raising it as a mixed crop. If intended for local consumption, it is frequently grown along with mustard, both seeds being expressed at once for their mixed oils. It is often, also, grown with nonyielding-oil crops in lines through the fields or in broad borders around the edges. It is estimated, however, that in all British India nearly 5,000,000 acres are now occupied by the present crop. The average outturn per acre from year to year is from 250 to 400 pounds, though in a few districts, such as Bustee and Goruckpoor, double this amount is claimed.

The arch enemy of this plant is rust, from which it always suffers in damp seasons. As linseed is sown in October and harvested in February, March, and April, it will not do at this early date to make esti-

mates in regard to the coming product. It can be safely said, however, that more space has been given to it this year than last, that the ground was in good order, that the seed germinated well, that the weather has been favorable, that the crop is growing finely, and that everything promises a good outturn.

Pure linseed oil has not an extensive demand in India, there being practically but one linseed-oil mill in all this region. The oil cake does not seem to be appreciated as a food for cattle; consequently almost the entire production is exported. The first exportation was in 1832 and amounted to 10 bushels. In the year ended March 31, 1861, it was 550,700 cwts.;* in 1881, ended as above, 5,997,172 cwts.; and during the year ended March 31, 1889, 8,461,374 cwts.

The subjoined table sets forth the imports into the chief seaports from the interior during the three years 1886–1889.

Exports take place chiefly in the quarter ended on the 30th of June.

The United Kingdom receives about 65 per cent. of its total supplies of linseed from India, the remainder going chiefly from Russia. In 1851 the total demand in Great Britain amounted to only 630,471 cwts., whereas in 1889 India alone furnished the United Kingdom 5,295,175 cwts.

During the year ended March 31, 1890, the exports of linseed were as follows:

Countries.	Quantity.	Countries.	Quantity.
	Cwts.		*Cwts.*
United Kingdom	4,342,962	Egypt	129,102
Austria	2,000	United States	772,758
Belgium	254,033	China	17,514
France	929,725	Austria	11,166
Germany	24,503	Other countries	420
Holland	324,943		
Italy	328,743	Total	7,146,896
Portugal	9,027		

Of the above, 5,124,285 cwts. were exported from Bengal, 2,013,169 cwts. from Bombay, and 9,442 cwts. from Sind.

During the eight months beginning April 1 and ended November 30, 1890, the following amount of linseed was exported:

Countries.	Quantity.	Countries.	Quantity.
	Cwts.		*Cwts.*
United Kingdom	2,772,488	United States	618,750
Belgium	225,009	Other countries	153,085
France	846,391		
Holland	588,630	Total	5,412,694
Italy	208,341		

From April 1 to December 15, 1890, the shipment from Calcutta to the different United States ports was as follows: New York, 551,060 cwts.; San Francisco, 65,394 cwts.; Philadelphia, 74,994 cwts.

*1 cwt. = 112 pounds.

The value of linseed has more than doubled since 1840, but of late years the price has varied but little.

The following table shows the price in Calcutta for the past five years per maund* of 82 pounds:

Year.	January.	July.	Year.	January.	July.
	Rs. A. P.	*Rs. A. P.*		*Rs. A. P.*	*Rs. A. P.*
1886	4 8 0	4 8 6	889	5 9 0	5 6 0
1887	4 8 0	4 7 0	1890	4 14 0	....
1888	4 4 0	4 3 6			

NOTE.—Rs. A. P. at the head of money column signify rupees, annas, and pice; 12 pice = 1 anna, 16 annas = 1 rupee = 40.4 cents.

In preparing the above report I have been kindly given access to the proof sheets of Dr. Watt's great work on "The Economic Products of India."

Table showing the imports of linseed by rail and river into Bombay, Karachi, and Calcutta during the three years 1886–'87, 1887–'88, *and* 1888–'89.

Provinces whence imported.	Into Bombay.			Into Karachi.		
	1886–'87.	1887–'88.	1888–'89.	1886–'87.	1887–'88.	1888–'89.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Bombay	35,240	25,328	27,738	....	....	....
Sindh	....	....	....	44	....	5
Bengal	....	....	33	....	....	....
Northwest Provinces and Oudh	35,769	11,373	16,264	....	2	53
Punjab	1,525	102	149	61	34	60
Central Provinces	39,008	24,036	27,738	....	....	....
Rajputana and Central India	33,101	28,546	23,681	....	....	....
Berar	25,787	22,402	28,397	....	....	....
Other provinces	9,346	10,369	10,161	....	....	....
Total	179,776	122,095	134,161	105	36	118

Provinces whence imported.	Into Calcutta.			Total.		
	1866–'87.	1887–'88.	1888–'89.	1880–'87.	1887–'88.	1888–'89.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Bombay	....	....	....	35,240	25,328	27,738
Sindh	....	....	....	44	....	5
Bengal	220,755	228,933	199,098	220,755	228,933	199,131
Northwest Provinces and Oudh	60,593	59,576	74,698	96,362	70,950	91,015
Punjab	....	41	252	1,586	177	461
Central Provinces	213	222	138	39,221	24,258	27,876
Rajputana and Central India	629	2,754	587	33,730	31,300	24,268
Berar	....	....	....	25,787	22,402	28,397
Other Provinces	1,603	2,017	2,311	10,949	12,326	12,472
Total	283,793	293,543	277,084	463,674	415,674	411,363

SAMUEL J. MERRILL,
Consul-General.

UNITED STATES CONSULATE-GENERAL,
Calcutta, January 7, 1890.

* There are two sets of weights in Calcutta, viz, the factory and the bazaar. The factory maund is equal to 74,667 pounds; the bazaar maund, the weight used by the consul-general, is 10 per cent. greater than the factory maund.

LINSEED IN THE ARGENTINE REPUBLIC.

REPORT BY CONSUL BAKER, OF BUENOS AYRES.

[From Consular Report No. 125.]

The flax industry in this country is only a very recent branch of its agriculture. It is only within the last few years, indeed, that it has had any development at all, and as yet there is very little to be said about it.

A COMPARATIVELY NEW INDUSTRY.

As late as 1877 the custom-house returns do not show that a pound of the seed had ever been shipped from any Argentine port. In 1878 the exports amounted to 35 tons; in 1880 the amount shipped had increased to 958 tons; in 1881 it was 6,394 tons; in 1882 it was 18,644 tons; and in 1883 it was 23,061 tons. About this time, owing to the steady foreign demand and the good prices which were obtained for the seed, a very general interest was manifested, not merely in the production of the linseed for foreign consumption, but also in the preparation of the fiber. Since then, with the advent of agricultural laborers from Europe, there has been a gradual increase in the breadth of land under this crop, the yield of which is variously stated to be from 20 to 40 for one, and for which the country seems to be very well adapted.

The range of the exports of linseed since 1883 will be seen from the following table:

Year.	Quantity.	Year.	Quantity.
	Tons.		*Tons.*
1884	33,991	1888	40,222
1885	69,426	1889	28,195
1886	37,689	1890 (9 months)	30,542
1887	81,204		

BREADTH OF LAND IN FLAX CULTIVATION.

The cultivation of linseed, however, is as yet almost exclusively confined to the provinces of Santa Fé and Buenos Ayres, though a little is now also grown in the province of Entre Rios. In 1881 the amount of land under flax cultivation was as follows, in hectares: Province of Buenos Ayres, 29,192; province of Santa Fé, 6,122; total, 36,314. In 1889 the breadth of land under this crop was as follows, in hectares: Province of Buenos Ayres, 43,899; province of Santa Fé, 73,009; province of Entre Rios, 4,161; province of Rioja, 34; total, 121,103. As the total area of land under crop cultivation in the Argentine Republic is 2,422,995 hectares, it appears that the amount at present put down in flax is only about 5 per cent. of the whole.

AMOUNT OF THE HARVEST.

I am unable to answer your inquiry as to the total amount of flax produced in the Argentine Republic. There is no way of obtaining the information, as the Argentine Government has no provision for crop reports. We can only estimate, and it is estimated that the harvest in the province of Santa Fé last year amounted to 56,887 tons, while that of Buenos Ayres was about 25,000 tons; total crop, say, 100,000 tons, including Entre Rios. In regard to the approaching harvest, it is stated that the acreage is larger than ever before, and, unless some misfortune overtakes the crop, the yield will show a very considerable increase over that of any previous year.

THE COMING CROP.

What the shipments will be, however, will depend a good deal on the price abroad, for there is now an annually increasing home market for the crop, as several oil mills have recently been established in the country, and great hopes are entertained that the production of linseed oils will henceforth be added to the category of national industries.

DESTINATION OF CROP.

The next crop will be harvested and ready for shipment about the 1st of March, and the business will probably run through the quarter ending June 30, 1891. The shipments will all go forward either from this port or Rosario. It is not possible to say whither the crop will be exported, but, as a general indication of the direction it will take, I give the following destinations which the shipments of 1888 and 1889, according to the custom-house returns, appear to have had:

Destination.	1888.	1889.	Destination.	1888.	1889.
	Kilograms.	*Kilograms.*		*Kilograms.*	*Kilograms.*
Germany	1, 805, 604	1, 792, 338	Holland		322, 790
Belgium	3, 490, 721	2, 623, 180	Great Britain	27, 650, 030	12, 289, 203
Brazil	114, 575	826, 100	Uruguay		10, 088
United States	2, 123, 470	6, 755, 263			
France	4, 917, 427	2, 134, 329	Total	46, 222, 888	28, 195, 816
Italy	121, 061	1, 422, 525			

MARKET VALUE.

The price of linseed in this market during the last year, according to the returns of the Buenos Ayres Bolsa, ranged as follows: January 1 to March 31, 57 to 70 cents; April 1 to June 30, 45 to 65 cents; July 1 to September 30, 45 to 75 cents; October 1 to December 31, 60 to 80 cents in current money per 10 kilograms. So far during the present year there has been a slight increase in the price.

CONDITIONS OF FLAX CULTIVATION.

As to the mode of cultivation here, I am but indifferently posted; but if it differs at all from that employed in the United States, it is certainly not for the better. I assume this to be so for the reason that no crops in this country receive that care and attention which good husbandry exacts. I may add that the crop is not a favorite one, although it is believed to pay well for the reason that it is thought that the cultivation very rapidly exhausts the land, so that most of the production is by those who do not own, but only rent, their farms.

It is only necessary to add, in regard to soil and climate, that flaxseed culture is exactly under the same conditions as that of wheat or corn.

E. L. BAKER,
Consul.

UNITED STATES CONSULATE,
Buenos Ayres, November 20, 1890.

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